THE MODEL ENGINEER

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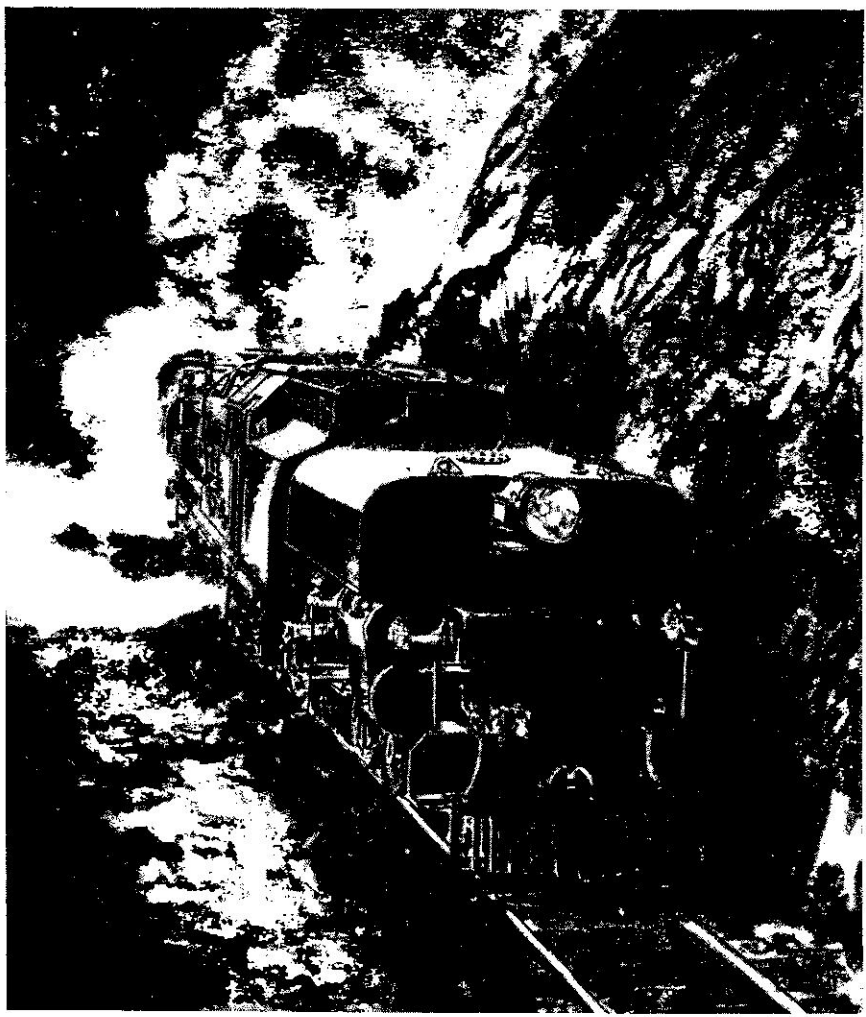

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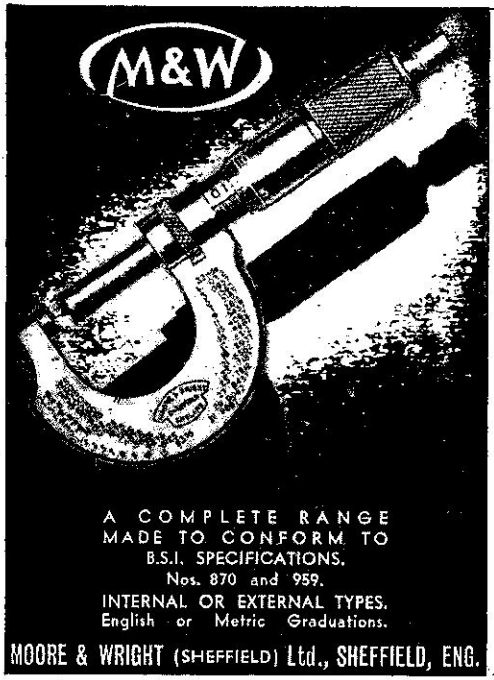

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THE

MODEL ENGINEER

Percival Marshall & Co. Ltd., 23, Great Queen Street, London, W.C.2
VOL. 94. No. 2355. JUNE 27th, 1946

"M.E." Exhibition Progress

THE preparations for the 1946 MODEL ENGINEER Exhibition are proceeding apace and everything points to a record show appropriate to a 21st birthday occasion. At a recent meeting of the joint organising committee, Mr. Pinnock, Chairman of the S.M. & E.E., said he thought we should require a building with indiarubber walls, so fast was space being applied for, and so many interesting exhibits promised. The trade section will be particularly complete, and though we may miss one or two of the older firms who have not yet resumed model production, it will be fully representative of post-war tools, equipment, and material. Some excellent entries are coming along for the competition section, and in view of this year's abundance of cups and prizes, the judges will have a very busy time in allocating the honours. Intending competitors should not delay in completing and returning their entry forms if they wish their work to find a place on the exhibition tables and catch the judges' eyes. *The last day for returning forms is July 13th.* Some remarkably interesting exhibits have been promised for the Loan Section. These will include the model of the Sprowston windmill made by the late Mr. H. O. Clark, which has been kindly offered by the Science Museum, a group of scale model motor cars lent by Messrs. Rootes, a working model of an escalator from the London Passenger Transport Board, the fascinating miniature cinema made by Mr. F. W. Bontor, of the Malden Society, and, of special topical interest, the official model of the new home of the House of Commons. In addition to their ever-popular passenger railway track, the Society of Model and Experimental Engineers will have a workshop in operation and a stand full of models working by compressed air. Model aircraft enthusiasts will be enthralled by the section organised by the Society of Model Aeronautical Engineers, an outstanding feature of which will be a display of captive planes in flight round the pole. The show will begin on Thursday, August 22nd, and will remain open daily, Sunday excepted, from 11 a.m. to 9 p.m., an occasion not to be missed by any of the model fraternity. Entry forms and all information may be obtained from the Exhibition Manager, 23, Great Queen Street, W.C.2.

A Long Haul for a Locomotive

IT is no new thing for an enthusiast to travel quite a distance with his locomotive to help a club to put up a good show, but I think Mr. Eric Rowbottom, of Cape Town, has set up a record which will be hard to beat. At Easter time he took his locomotive by car from Cape Town to Johannesburg to run at the exhibition organised by the Witwatersrand Society. The round trip there and back measured 2,000 miles! Mr. Rowbottom's locomotive is a 0-6-0 tanker, and has a small steam turbo-generator mounted on the boiler which generates current for the head-lamp and for a small pea lamp in the cab. Night driving becomes a pleasure. Mr. E. W. Osborn, who sends me this news item, tells me that the Cape Town Society now has the use of an excellent workshop, placed at their disposal by one of their members, for their regular monthly meetings and a weekly evening workshop meeting.

The "M.E." Index

ANOTHER volume of THE MODEL ENGINEER has now been completed and we repeat our offer to supply subscribers and regular readers with the index, if they will send us a stamped, addressed envelope (1d.) of sufficient size to take a copy of the journal flat. The index will not be printed until we know how many copies are required to fill the demand, but readers are requested to make early application to ensure that their copy is available.

Percival Marshall

A 9½-in. GAUGE LOCOMOTIVE

By G. WOODCOCK

IN selecting the size and prototype of this model, the writer was influenced by three main points. (1) Having constructed in all gauges from 3½-in. to 7½-in., it was felt that something more robust than a 1½-in. scale model was needed, and 7½ in. had, with use, come to be, or seemed to be, rather small. Incidentally, unkind friends say the next will be 4 ft. 8½ in. (2) The engine was begun in late 1944, when the usual model materials were unobtainable. An engine of this size calls for very little in the model material line, and as I could obtain general engineers' stocks and castings, this decided it. Actually, the only finished articles bought were 3/32-in., ⅛-in., 5/16-in. and ¼-in. rivets, and two-dozen 3/32-in. round-head brass screws, all nuts, studs and bolts being made for it.

(3) I rather fancied the prototype, although I have been, through force of circumstances, compelled to make one or two alterations to use up material in hand and to adapt the engine for a working model.

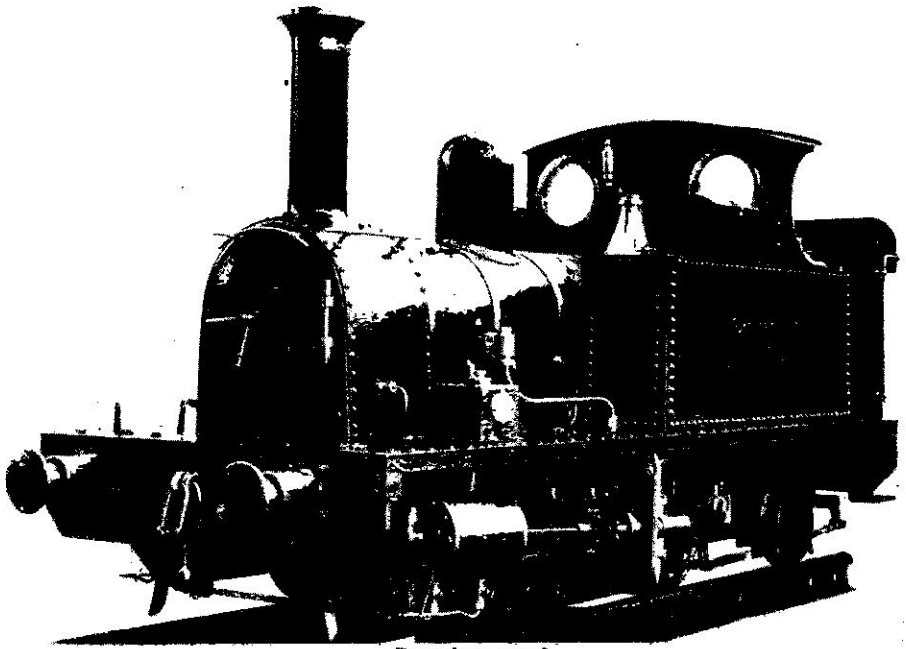
In those halcyon pre-1914 days, when a little boy, visits were paid to an uncle in the West Country, and the journey involved travelling over the Somerset & Dorset Joint Railway. There were, at that time, three of these engines in service on the line—two were saddle tanks, built by the company at Highbridge, and used for shunting at Radstock. The origin of the other, which at that time was a side tank with an all-over cab, was lost in the mist of antiquity. It had, however, been rebuilt, virtually a new engine, by the company about 1896, and was used to work a " pull and push " service between Burnham-on-Sea and Highbridge. Later it was converted to a saddle tank to conform with the others and scrapped about 1925, when I last saw it.

To commence the job, the frames were hack-sawed and filed out of ¼-in. × 6-in. × 4 ft. 3-in. mild-steel plate. These are angled with cast-steel angle plates to buffer beams, 4½ in. × ⅜ in. × 18 in., with ¼-in. iron rivets, and bolted to frame with ¼-in. B.S.F. bolts.

The frames are stayed in the traverse plane by a motion plate, trailing truck stretcher pin plate and rubbing plate. The horn-blocks were also cast in steel and machined four at a time on the planer. These are riveted in with eleven ¼-in. rivets each, the horn-stays being correctly tongued into the horn-blocks and retained with square-shouldered studs, as in full-size practice.

Footplate brackets, also of cast-steel and ⅜-in. × ⅛-in. angle, were attached to frames for carrying the running-plates. The axleboxes were machined and fitted with oil well on top, keeps and oil pads, the finished boxes measuring 2½ in. by 2⅛ in. by 1⅜ in., the jaws of the horn-blocks being 2⅛ in.

The axles are of 1½-in. high tensile steel, 55 tons, and are journalled to 1⅜ in. for boxes, and 1¼ in. for wheel seats; the eccentrics were made and fitted to driving-axle, their size being 2⅜-in. O.D. on tongue and ⅝ in. wide, with ½ in. eccentricity for 1-in. valve travel with launch links. They are set upon the driving axle with 5/16-in. Allen set-screws and lock-nutted in a recess formed in the sheave. Driving wheels are of cast-iron.

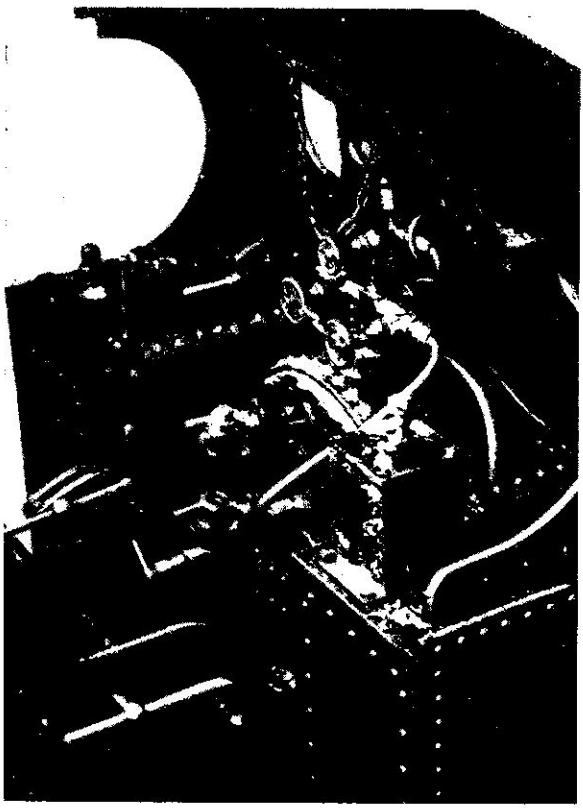


Pounds or tons?

It was intended to fit tyres, but difficulty was experienced in getting a piece of high tensile steel of a suitable outside diameter, namely, 8 in., so the project was shelved until the wheels wear out, if ever. Mild-steel was obtainable, but I have found that mild-steel tyres wear about as well as cast-iron wheels, so no advantage would have accrued from their use.

Wheels were bored for axles and jig-bored ¾ in. for crankpins on an eccentric pin set on lathe faceplate. The crankpin at the point of shear in wheel-boss is ⅞-in. O.D. This gives a greater factor of safety, actually the F.O.S. is five. The wheel bosses are, of course, counterbored to receive this shoulder. Wheels were finish turned on their own axles. Before forcing both wheels on to their axles, the side-rods were made. These were cut out of ⅜-in. × 1½-in. black mild-steel, and are 14-in. centres. The eyes were roughly formed and the metal between removed by the planer. Two buttons were made, one 1⅜ in. diameter, spot-on, and ½-in. bore, the other, 1⅜ in. diameter, and stepped to 1 in. The rods were too long to swing in the lathe so were bolted to angle plate and set on lathe saddle, and one end was drilled and bored to 1 in., after the manner used in full-size practice. The button with the 1-in. spigot was pressed into this hole and a ⅜-in. Whitworth hole drilled and tapped approximately where the other crank-pin hole would come—the other button being lightly bolted on to the rod. These buttons were then pushed into the bores of the axleboxes when in the frames, and the loose button tightened, the rods are returned to the lathe and checked to centre with an indicator; when set, the button was removed and the other end bored.

When the rods were completed, the wheels were roughly quartered and finally set by putting the rods on and turning the wheels until no tight places were found; the wheels then being pressed on and keyed. The pressing was accomplished by two bars of 2-in. × 1½-in. mild-steel, and two ¾-in. Whit. bolts, 16 in. long. Though great care was taken in the quartering, it may be mentioned that it is necessary to allow a certain amount of clearance upon the leading crankpin bushes to permit of enough freedom to allow the wheels to follow any unevenness on the road. Actually, the leading bushes are bored 0.005 in. oversize, the driving crankpin bushes being a fit. In passing, it may be mentioned that in full-size practice it is usual to allow about 1/32 in., partly for the same reason and partly because the actual wheel centres alter slightly when the engine is in steam owing to the expansion of the frames from the heat of the firebox.



Close-up of cab fittings

The next job taken in hand was the patterns for cylinders and valve-chests. The cylinders are 2½-in. bore by 3½-in. stroke, and are, of course, in cast-iron. The cylinders were first marked off and machined on port and bolting faces on the planer. Boring was done in lathe and facing with a facing attachment at the same setting. The ports are milled and drilled, being, steam 7/32 in. × 1¾ in., exhaust 7/16 in. × 1¾ in. The valve-chests and cylinder-covers are straightforward jobs calling for little mention.

Pistons are bronze with two 5/32-in. rings in cast-iron. Pistons are fitted to rods with correct taper, as are also the cross-heads, the piston-rods being stainless-steel, 9/16 in. diameter, 7 in. long, turned between centres from ⅝ in.; the piston-heads being finished at the same setting to ensure concentricity. Cross-heads, of the alligator type, are of steel, 2¼ in. × 3 in. × ⅞ in. The piston-rod was fitted on taper and cottered with ⅜-in. × 5/32-in. cotter, the slot being formed by drilling and drifting, the slot carried back after for "draw."

The connecting-rods are forgings, big-ends being of the split brass type and fitted with cotters; the little-ends having a plain bush for ½-in. cross-head pin; centres of connecting-rods are 13 in. The machining of the rods was performed on the planer after the manner of the side-rods.

With regard to the motion, this is Stephenson's link with launch links.

The eccentric-rods are small forgings and fitted to eccentric straps with $\frac{3}{16}$-in. studs and lock-nuts. Expansion links are slotted to a length of three times the valve travel, viz., 3 in. plus ½ in. for link slip. These were cut out and the slot $\frac{7}{16}$ in. wide left 0.025 in. undersize. The links were then normalised and packed in lime until cold. The slot was then corrected and filed out 0.002 in. undersize, the link then being hardened and the link and hardened die-block fitted to each other with emery slips. Weigh-shaft is 10 in. long by ¾ in. diameter, with arms keyed on with $\frac{3}{16}$-in. square keys. This turns in two plummer-blocks bolted to the frames and fitted with split gunmetal bushes, ⅝-in. bore, ¾ in. through. Four suspension links, 4⅛-in. centres, also forged to obtain long bearings, for link trunnions and weigh-shaft bearings, were made, and the motion assembled. Valve spindles and intermediate spindles were next made and fitted, the valves being driven by buckles. A method of fitting the motion pins may be noted. These are of the pear-headed pin, very common in full-size practice. These pins have an oblong head which is retained by a stud ¼-in. Whit., and lock-nuts. This greatly facilitates removing any part of the motion for repair at any time. Motion being completed, the brake-gear was made and fitted. The blocks are castings, the remainder being in steel. The brake-shaft, 11 in. long, ¾ in. diameter, was a forging in split bearings. Brake-shaft is actuated with a $\frac{7}{16}$ in. diameter by 8-t.p.i. square-thread screw.

At a later date it is intended to fit an ejector to operate vacuum brakes on the train. Two more details added to the chassis at this time were working sanding gear, the sand boxes being located on the running-plates and operated from the cab.

The cylinder cocks are also operated from cab, through a bell-crank on to a cross-shaft placed below the cylinders. The cocks themselves are the correct plug type and not balls in holes, as so commonly used. A pump is driven from the left-hand cross-head, ½-in. bore, and 3½-in. stroke; the by-pass for this is operated from the cab. The buffers are of steel, 3-in. buffer faces. Screw couplings are fitted.

The chassis being completed, attention was turned to the boiler. Whatever some good people may say to the contrary, the writer is a great believer in a large firebox, that under consideration being 12 in. long, 9 in. deep, and 5 in. wide.

Boiler diameter is 7 in., or a 3 ft. 6 in. boiler on the prototype, and 2 ft. 6 in. long over barrel and firebox. There are twelve ¾-in. tubes and no superheater. A 4-element superheater has now been fitted. In the construction of this boiler I particularly wanted to construct one with as little brazing as possible. Plates are: barrel and wrapper plates, ⅛ in. thick; throat plate, front tube plate and firebox back sheet, $\frac{3}{16}$ in.; firebox tube sheet and back plate, ¼ in.; all in copper, all rivets ¼ in., pitched three diameters. The firebox was riveted and silver-soldered; the barrel and outer wrapper plate and throat plate also being silver-soldered, the remainder being riveted only. Needless to say, with this method, perfect plate fitting is necessary, also rivet holes must be drilled undersize and reamed out as the riveting proceeds, otherwise the holes will be out owing to the plates stretching with the stresses set up by closing of the rivets.

The foundation ring is of ¾ in. × ½ in. section, fitted in box and half lap jointed, and brazed before fitting, All plate joint ends are feathered down, no stepping being permissible here.

Firebox is stayed with eighteen, $\frac{5}{16}$-in. × 26-t.p.i.; direct stays double nutted. The crown has six $\frac{5}{16}$-in. direct stays and a 1½-in. × $\frac{7}{16}$-in. × 1½-in. roof-bar of copper, inverted and riveted, and silver-soldered to the crown of the box. Fire tubes are screwed into the firebox and expanded into front tube plate and beaded over. When this was completed and dome fitted, this and all other openings were closed and the boiler subjected to a hydraulic test; a few rivets wept, which were caulked, and it then stood 175 pounds p.s.i. and 100 pounds steam.

Smokebox was made up from ⅛-in. steel plates flanged over a former, the wrapper being German silver riveted round. Chimney is 2½ in. diameter inside, 8 in. long, fitted with a copper top and base flanged from ⅛-in. steel plate.

All boiler fittings were home-made and include water gauge, blower valve, whistle valve, blow-out cock and regulator. Two check valves are fitted on what would be the front ring of the boiler barrel.

Regulator is of the flat-faced slide-valve type on a ¾ in. diameter stand pipe, the cats-head being gunmetal. The regulator-handle is 4½ in. long, thus giving a fair range of throw. A safety-valve, ½-in. bore, direct loaded, is fitted with 45 deg. mitre-valve.

The boiler being completed and tested, it was mounted in the chassis, and smokebox and chimney fitted up, together with steam and exhaust pipes, and a four-hole blower fitted on blast-pipe cap.

At this stage it was possible to form some idea of what tension springs would be required, and these were then made up. These have twelve leaves, $\frac{1}{16}$ in. thick, ¾ in. wide, the top plate or leaf being composed of three of these to this size, 6 in. long. The others, of course, are reduced in proportion in length; buckles are of ⅞-in. × 1-in. steel, fitted to the spring-pins on the boxes.

The trailing truck was then made up and put under. It has ¼-in. thick frames and $\frac{3}{16}$-in. stiffener plates, and end-plates, riveted with ¼-in. and $\frac{3}{16}$-in. rivets. The horn-blocks are steel castings bolted to side plates. Boxes are correct type with keeps. Axle diameter 1⅛ in., journalled to 1 in. into wheel seats and turned with correct radii collars. The wheels are cast-iron, 4½ in.

diameter on tread. Springing is by coil springs, both for boxes and side control; the total movement of the truck sideways is $\frac{3}{4}$ in.

A reversing lever with sector plate and seven notches, viz., three each side of mid-gear, is fitted, the lever being $9\frac{1}{2}$ in. overall, to obtain a good leverage, as the motion requires quite a bit of moving when running.

The boiler was at this stage covered with a sheet of 24-s.w.g. sheet-brass, held with $\frac{1}{2}$-in. × 1/32-in. lagging bands. A dome cover was beaten up out of the same material in three pieces, viz., top, barrel and flounce, and silver-soldered, together with half-lap joints, afterwards filed off. Safety-valve casing is a casting of the Stirling G.N. pattern, which was at one time much used on the Somerset & Dorset Railway. Actually, this was the Johnson Midland influence. The running-plates and foot-plates were then added, of 5/64-in. sheet-steel, secured by angles and cast-steel brackets to the frames, a $\frac{5}{8}$-in. × $\frac{5}{8}$-in. × $\frac{1}{8}$-in. angle being run along the outer edges and stepped down to the buffer beams.

The side tanks are of 3/32-in. sheet-brass, and $\frac{3}{4}$-in. × $\frac{3}{4}$-in. × 3/32-in. brass angle, with $\frac{1}{8}$-in. snap rivets, built up with angles as in full-size practice, except that the back plates are put in with $\frac{1}{8}$-in. round-head brass screws. These tanks have a capacity of six gallons. A hand pump is submerged in the right-hand tank, having a bore of $\frac{3}{4}$ in. diameter. The handle is hidden in the right-hand tool box, which, by removing four screws in the bottom and undoing a $\frac{5}{8}$-in. × 26-union below the foot plating, enables the pump to be bodily removed from the tank. The left-hand tool box performs its legitimate purpose.

When the question of a cab came up, it was deemed necessary to depart from the prototype, which had an all-over cab.

As I particularly wanted to sit on the engine and drive it, and not to do so from a truck, I decided on an arrangement which was adopted on the two G.W.R. tanks which ran on The Surrey Border & Camberley Railway prior to the war. This enables a piece of wood, about 3-in. square, to be placed along the top of the bunker sheet, and by resting one's feet on the engine footsteps, a fairly comfortable driving position is obtained, if one wears a pair of glasses and doesn't object to cinders.

The cab is of 5/64-in. plate, and $\frac{1}{2}$-in × $\frac{1}{2}$-in. × $\frac{1}{16}$-in. steel angle, and the bunker is of 3/32-in. plate, and $\frac{5}{8}$-in. × $\frac{5}{8}$-in. × 3/32-in. angle, and plenty of rivets and screws, as it is, of course, required to support a good weight. Hand rails are fitted to bunker sides and lamp irons at rear.

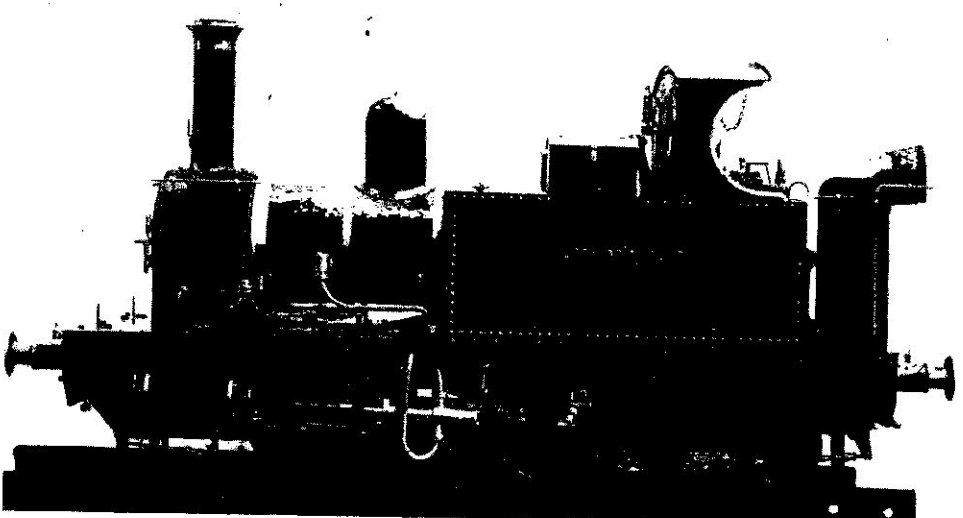
Lubrication is by a hand-feed force pump, which can be seen in the photograph on the right-hand tank in cab. This delivers into the header in smokebox, thus ensuring an equal supply to both cylinders.

I prefer this type, as it is possible to dope the engine when it is standing by for long periods much more easily than fiddling with a mechanical lubricator by turning the hand wheel.

The grate and ash-pan do not drop, the fire being cleaned through the fire-hole. The grate is made in two sections, $2\frac{3}{8}$ in. wide, 11 in. long, which pass through the $2\frac{1}{2}$ in. diameter fire-hole and into place.

This, I think, concludes the description of the engine, its main object of construction being to possess an engine of very robust construction and long wearing properties, which would be suitable for use, day in day out, on a passenger-carrying line.

It was also wished to incorporate all details of a full-size engine, with such modifications as were necessary for a working model, and I think if one takes a look at the photographs, one cannot tell if it is inches or feet.



0-4-2T.; outside cylinders, 2½-in. × 3½ in.; coupled wheels, 8 in. on 14 in. wheel-base; total wheel-base, 29 in.; length over buffers, 5 ft.; height, rail to top of chimney, 2 ft. 2 in.; width, 18 in.; working pressure, 70 p.s.i.; grate, 12 in. × 5 in., or 60 sq. in.; weight empty, approximately 4 cwt.

★ Petrol Engine Topics

"CARVING OUT" A TWO-STROKE ENGINE

by Edgar T. Westbury

MILLING operations on the housing can be carried out with the aid of a very simple fixture, to clamp in the tool-post or on the top-slide of the lathe, and which enables the work to be presented to milling cutters running in the lathe in such a way as to remove the unwanted metal between the ribs.

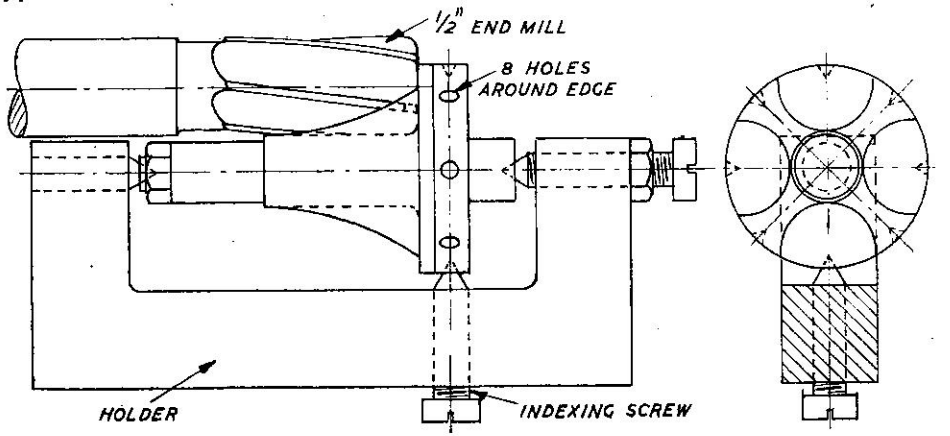
The device which I used to hold the main-bearing housing for the milling operations was a dividing attachment which I made many years ago, and which has served a very useful purpose in tackling some hundreds of awkward little jobs. It is, however, possible to carry out this particular job with a very simple form of work-holding device, as illustrated in the drawing herewith. This consists of a bracket carrying a pair of centres, between which the housing, on its mandrel, can be mounted, and incorporating a simple method of indexing to bring the work into the required positions for operating on with milling cutters. The bracket may be made by forging, cutting from the solid, or building up ; a section cut from a piece of 3-in. channel steel would provide just the right shape. In any case, it is essential that it should be firm and rigid, and that the two sides should be parallel with each other, and with the axis of the centres, so that the work is truly horizontal when it is mounted either in the tool-post or clamped, with a parallel packing block interposed, on the cross-slide.

The centres may consist of ordinary set-screws, with the points turned to an included angle of 60 deg., and it will be seen that the one at the left-hand end is cut off flush with the outside of the bracket to reduce the space occupied at this end, and thus minimise the overhang of the milling cutter used for the preliminary roughing out. If this centre requires locking, it can be done by means of a grub-screw from the side, but a fairly tightly-fitted screw will avoid the necessity for any locking device at this end, though the use of a lock-nut, on a less tightly-fitted adjusting screw, is desirable at the other end.

The means of indexing shown on the drawing is simple, and may even be considered primitive, but is quite effective in practice. Eight divisions are marked around the edge of the housing flange—here again, the use of a simple indexing device on the lathe headstock will prove invaluable, especially if a simple drilling spindle is also available—and indentations are made with a small centre-drill to take the point of the indexing screw. If found more convenient, the drilling may be done in an axial direction, so long as the indexing screw is located to suit ; and in either case, it should be noted that the drilling should be done in metal which is afterwards machined away when the flange is shouldered down and screw-cut to fit the crankcase barrel.

For the roughing-out operation, the work-holder may be held on its side in the tool-post, with the mandrel axis parallel to the lathe centres, and exactly level with centre height. In both this and the succeeding operations, careful adjustment of packing is necessary, and some workers find this tedious and bothersome, but it can be very considerably simplified if one takes the trouble to keep a stock of packing material of graded thicknesses. In my own case, I keep a

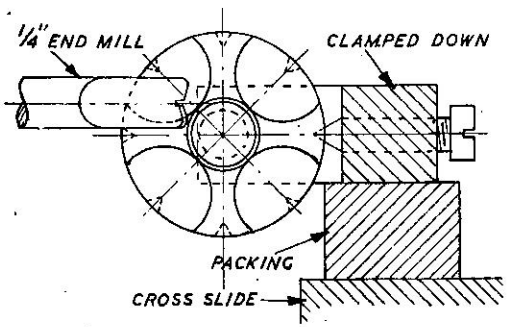
*Continued from page 577, "M.E.," June 13, 1946.



Front housing held in simple indexing holder for roughing out metal between ribs with end-mill (Appearance of work after this operation shown in end view)

box into which offcuts of bar, strip, and sheet material are deposited, and if one takes the trouble to note the exact thickness of all these odd bits, and mark them accordingly, it is quite an easy and expeditious matter to build up parallel packings to any desired thickness.

The drawing shows quite clearly how the ½-in. milling cutter can be used to remove the major part of the metal between the ribs. A standard multi-fluted cutter is shown in action, but, of course, a home-made flat cutter will serve the purpose almost as efficiently, and one virtue of the latter is that it is easier to keep in keen condition, with the aid of a honing slip, than the ready-made type. It will be seen that a cutter having a small radius on the nose is used, and this is more easily achieved with a home-made cutter; but if a sharp-cornered cutter is employed, it should not be run right to the end of the cut when fed to its full radial depth, as in the position shown. The appearance of the housing, after four cuts have been taken with this cutter in alternate index positions, is shown in the end view.



Finish milling of ribs on front housing

It is now necessary to set the holder with its mandrel axis at right-angles to the lathe centres, for milling the ribs to their finished thickness with a smaller cutter, as shown in the next drawing. In most types of lathes, it will not be possible to use the tool-post for mounting the holder, as it does not allow the work axis to be set low enough; and though it might be possible to pack it up above centre and work on the underside, this is not desirable, as it prevents or impedes one from seeing what the cutter is doing. "Blind" working is inevitable in some cases, but most of us avoid it wherever possible, and it certainly enhances the pleasure of machine-tool operation to be able to see the cutting-tool in action.

It is thus generally advisable to support the work-holder on a packing block on the cross-slide, clamping it down with one or more bolts and plates or "straps." Note that the thickness of the rib is determined by the height of the work centre, in conjunction with the diameter of cutter used. If a ¼-in. end-mill is employed, the axis of the mandrel should be 3/32 in. below centre height to produce a rib $\frac{1}{16}$ in. thick. The milling should be carried out by taking a number of light cuts along the length of the rib, i.e., using the cross-slide feed, and feeding up the saddle towards the headstock a little between each cut. Use the cross-slide index to determine the limit of the cut, where the rib joins the flange of the housing.

The cutter will, of course, leave a radius or "fillet" at this point, which is not undesirable, either from the structural or aesthetic point of view, but if it is desired to reduce this radius, a smaller diameter cutter may be used. Index the work in the intermediate positions, between those which were used for roughing out, and after milling one side of each rib, reverse the entire holder end for end, and proceed in the same way to mill the other side. Afterwards, the small ridges left in the cylindrical portion between the ribs may be removed by a small end-mill or dental burr, with the work still in the holder, but turned a little at a time between each cut, and using the index-screw merely as a friction lock, not engaging it in the holes. The same procedure may be used to clean up the face of the flange, between the ribs.

The mandrel, with the housing mounted on it, is now mounted between centres, and the flange end shouldered down to $\frac{7}{8}$ in. diameter to take the thread. It is desirable to provide an undercut at the end of the threaded portion, to enable the housing to screw right home to the shoulder, but this should not be wider than is absolutely necessary to clear the tool point, as the length of the spigot is only ⅛ in., and one cannot afford to reduce the effective length of thread very much. A parting-tool with a slightly rounded nose, 1/32 in. wide, will serve for this undercut.

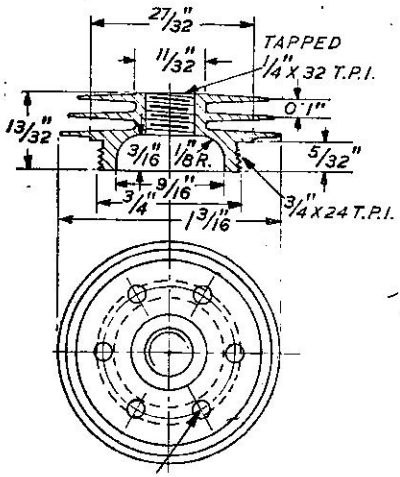
Screw-cutting is a straightforward operation, but as the tool must approach very closely to the shoulder, it will require due care, and the side of the tool may have to be ground away to enable the point to approach sufficiently closely. The fit of the thread should be as neat as possible, so that it screws home fairly tightly, and it is desirable that the ribs should be in a symmetrical position—either diagonal or "four-square"—when it is screwed home. This may be achieved either by a light skim over the back of the flange rim or by shimming up on final assembly.

The two main-bearing bushes may now be made and fitted, using a medium quality bronze and pressing them in fairly tightly, passing a $\frac{3}{16}$-in. reamer right through to finish the bore after insertion.

Cylinder-head

This is a fairly straightforward turning operation, which may be carried out entirely at one setting if bar material is used, with chucking allowance to spare. The shape of the interior of the combustion head should be finished clean and smooth, a hand tool being usually better than a form tool for this purpose, and the hole for the sparking-plug may be tapped, as screw-cutting a hole of this size is rather a delicate operation. (I have found no particular difficulty in obtaining taps for either ¼-in. or ⅜-in. sparking-plugs from regular tool dealers.) Use the same tools for machining the fins as for those on the body component. The screwcutting operation follows the same procedure as for the main housing, including the undercutting to enable the head to screw fully home. It is desirable to

arrange that the end face of the head-spigot makes contact with the rim of the cylinder liner to form the pressure joint, leaving a very small gap, not more than one or two thousandths of an inch, between the top face of the body and the shoulder of the head.



Cylinder-head

The six holes around the top fin of the head are for the purpose of enabling it to be screwed up with a pin spanner, but alternative means of effecting the same purpose may be preferred by some constructors, and are permissible so long as they are neat and serviceable. Make certain that the top face of the sparking-plug hole, which is raised slightly above the top fin, is perfectly clean and square with the hole, and chamfer the mouth of the hole slightly, to afford easy entry for the plug.

Rear Housing

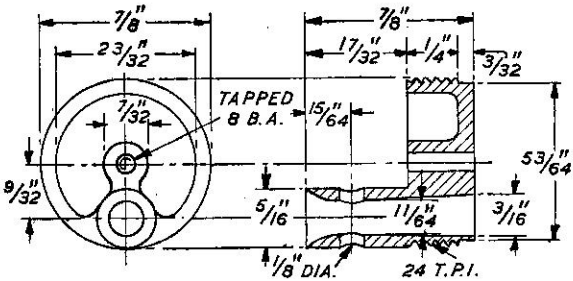
Use a length of bar sufficient to provide ample chucking allowance over and above the total length of the component, including the carburettor stub. The end face is first machined, finishing this as clean and accurate as possible, as it forms a seating for the rotary admission valve. Next turn and screw-cut the outer diameter to fit the crankcase thread, noting the lip at the end to afford easy entry and avoid risk of damage or distortion to the seating face. The centre hole for the pivot-screw is also drilled and tapped at this setting, and although not shown in the drawing, it is desirable to chamfer or relieve the mouth of the hole to prevent the possibility of throwing up a burr which might foul the valve face. As a matter of fact, a slight relief in the centre of the face, up to about $\frac{1}{4}$ in. diameter, is quite good practice, and may be applied to either or both the mating parts.

It is now necessary to set the component 9/32 in. out of centre to machine the carburettor bore. This can be done in the four-jaw chuck, using packing blocks in one or more of the jaws if necessary, but a still better and more facile method is to call in our old friend, the Keat's vee-angle plate, for this operation. Drill the hole to the throat diameter of 11/64 in. and taper it out with a reamer or D-bit, or by means of a small boring tool; the exact angle of taper is not critical, and any reamer of a taper between 5 and 10 deg. included angle may be used; if the taper is steep, it need not be carried right to the throat, but should be governed by the bore at the discharge end.

While thus set up in the eccentric position, the outside of the carburettor stub may be turned down to $\frac{5}{16}$ in. diameter, and the component may then be parted or sawn off.

To finish the flare of the carburettor intake, a tapered pin mandrel may be turned to fit the bore, and will hold the work sufficiently tightly for this operation. A hand tool, such as a small half-round or three-cornered scraper, will be found suitable for shaping this part.

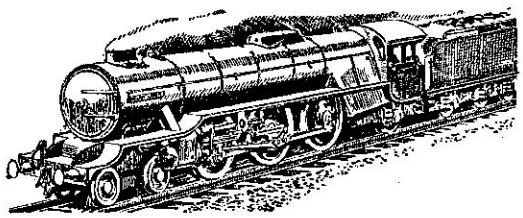
The recessing away of the surplus metal in the back of the endplate can be carried out in two or three different ways. In my own case, I held the work in a screwed ring gripped in the lathe chuck, and used a light milling spindle held in the tool-post; but for those who do not possess appliances of this nature, it may be found more convenient to clamp the work to a rotatable fixture on the cross-slide, and work on it with a cutter in the lathe chuck. One very convenient fixture for rotary milling, which is used by some workers, consists of a mandrel mounted in a bearing, which can be attached to the cross-slide. This is screwed to take the lathe chucks, and provided with a means of rotation, which may consist of a simple lever, or a more elaborate device such as a worm and wheel. The provision of stops to limit rotation is a useful addition to such an appliance. If the constructor considers that the making and fitting up of lathe attachments to deal with work of this nature is a waste of time, it is up to him to devise ways and means of achieving the same result without them; but in my experience, this may prove to take considerably more time than making special tools.



Rear end cover, including carburettor body

(To be continued)

"HIELAN' LASSIE"

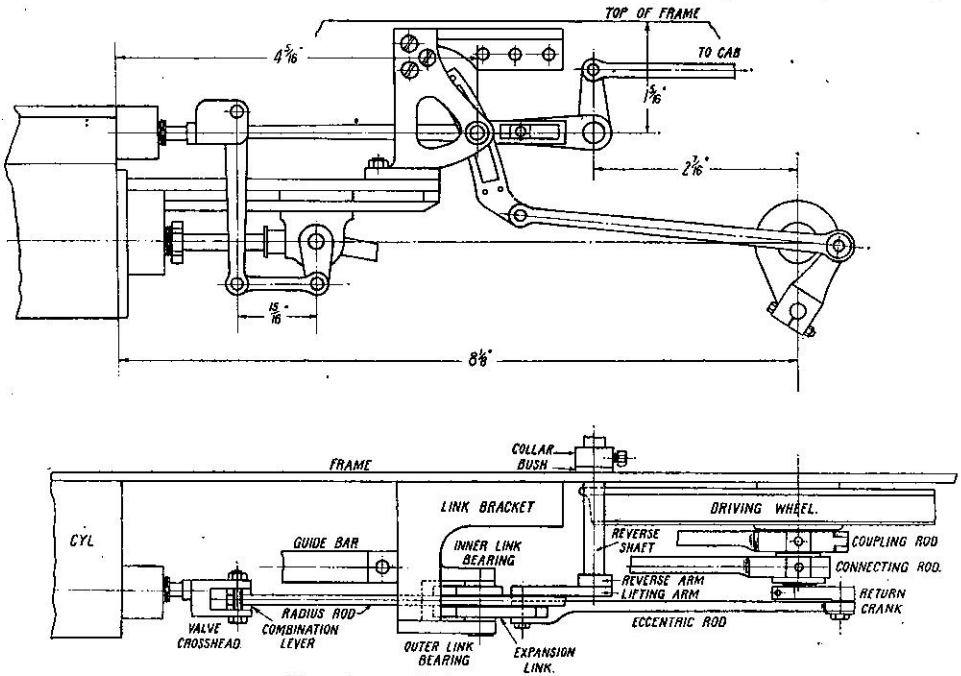


By "L.B.S.C."

HAVING now finished performing conjuring tricks, evolutions and other sundry antics with the cardboard strips, pins, bits of tin and other impedimenta to which no self-respecting locomotive drawing-office would give house-room, I beg to submit the final result to the good and patient folk who are building "Hielan' Lassie." Incidentally, the artist who drew the heading pictures of a "Lassie" in action, must have a wonderful conception of the efficiency of my valve-gears, for he has portrayed her apparently knocking spots off "Mallard's" record *with the dieblocks slap in the middle of the links*, which is far more than ever your humble servant claimed! However, he is in good company; I often had a chuckle at the Southern Railway poster showing a "King Arthur" puffing clouds of steam out of the chimney with the regulator shut, and the picture-postcard of L.N.E.R. 10,000 (the original "galloping sausage") also sailing across the landscape with the smokebox door open. Poets aren't the only ones who claim licence!

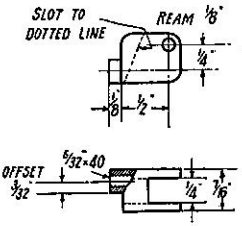
However, to get down to business, anybody who has made and erected the inside valve-gear, has nothing to fear from the outside ditto, and very little in the way of detailed instructions will be needed. It is, as you will see, a straight-line layout, easy to make and erect. The bracket which carries the expansion links and supports the guide-bars took a little bit of scheming out, in order to get the correct location of the links and please Inspector Meticulous & Co. as to external appearance. Personally, I could have designed a simpler and, I think, a better doings altogether by turning the whole issue around the other way and using a bracket something like a Baker girder; but that wouldn't have pleased the fraternity mentioned. Anyway, I'll be giving the Baker gear complete as an alternative, having been requested to do so; and that, of course, will have its own type of support.

Just as I was going to draw out the valve crosshead as an open knee-joint, I suddenly recollected a wheeze worked on a rebuild job some fifteen or more years ago. The engine was one made by a well-known firm to a well-known design, in which the combination-lever was merely an ornament [?] swinging on the same pin which attached the radius-rod directly to the valve crosshead, the valves having neither lap nor lead, and cutting off



Elevation and plan of outside valve-gear

at 100 per cent. all the time, wasting half the steam generated. The engine couldn't keep going with its own tender. I opened out the ports and made new valves, with proper laps; and to get the necessary advance, without making radical alterations to the valve-gear, new valve forks or



Valve crosshead

crossheads were fitted, of the same pattern as those shown in the accompanying illustrations. The idea of the deep "side sheets" was not only to allow the combination-lever to be pivoted at the correct distance above the valve spindle, whilst still keeping the radius-rod in line with same, but also to prevent any side-wobble of the combination-lever itself, as the whole valve-gear was just a rickety-rockety tinpot blue pencil joke. In fact, it was just bits of Jerry-silver, innocent of fork joints, and pinned together by $\frac{1}{16}$-in. rivets. As my "patent" valve crosshead did the needful in keeping the combination-lever in the straight and narrow path, I thought we might as well use a similar doings in the present instance, so I substituted it for the open knee. As will be seen, it gives plenty of support to the head of the

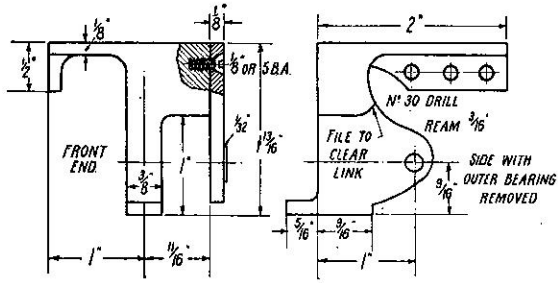
manner as described for the normal one on the inside valve-spindle; but when cutting the slot, note that it must be longer at the bottom than at the top (note dotted lines) to allow full swing for the combination-lever. It must be screwed tightly on to the valve-spindle, with the pinhole uppermost; if the threads are at all slack, put a $\frac{1}{16}$-in. pin clean through boss and valve-spindle, so that it won't try to come adrift when "Lassie" does the "Mallard act."

Components are Similar

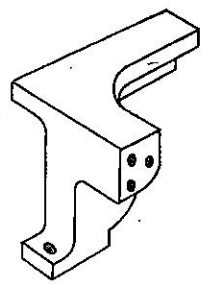
The combination-lever, union-link, radius-rod and expansion-link are the same as for the inside cylinder, except that the union-link is $\frac{15}{16}$ in. between centres of pinholes instead of $\frac{7}{8}$ in., this being due to the difference in length of the inside and outside connecting-rods, and your humble servant's hatred of odd thirty-seconds and sixty-fourths. Therefore, I need not detail out that part of the instructions again; with the exception mentioned, take your measurements from the illustrations of the inside valve-gear. Don't forget, however, that you need one link the same as the inside one, that is, left-handed, and one with the tail on the opposite side, for the right-hand side of the engine. Same applies to the offset of the valve crosshead.

Motion Bracket

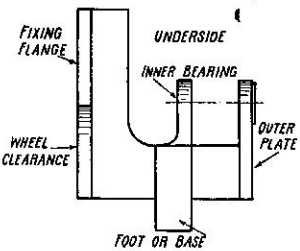
Whilst the motion bracket is somewhat similar to the one I used on "Bantam Cock," it is a little more complicated, by virtue of having an inner bearing for the expansion-link, same being supported on both sides, as in the full-sized engine. If all goes well, our good friends who have supplied other castings for the "Lassie" should be able to

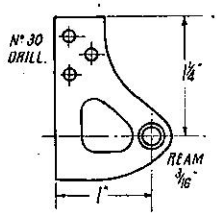


Details of link bracket

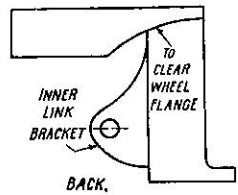


View of bracket, with outer plate removed





Details of outer plate

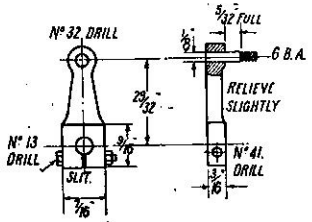


Back view of bracket

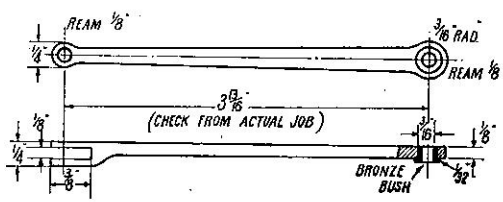
combination-lever, so that the fact of the drive being offset doesn't matter a Continental. If you make the fork joint at the bottom a proper fit, the lever cannot move sideways, and the wide and deep one at the top is virtually equal to separate guides. The gadget itself is made in the same

provide cast motion brackets as well, saving a lot of "fabrication work." The casting will be in two parts, the main part being screwed to the frame, and the foot or base to the top guide-bar. In order to be able to erect the link easily, the outside plate is made detachable, being fixed to

the projection on the casting by three $\frac{1}{8}$-in. countersunk screws, as shown in the elevation drawing. All the necessary "machining" *can* be done with a file, providing the person at the handle end of same is a careful file-driver; but it is important that the contact face for the outside plate, and the flange which is screwed to the piece of $\frac{1}{8}$-in. by $\frac{3}{8}$-in. strip could be brazed or silver-soldered to the edge. The column above the foot could be a piece of $\frac{3}{8}$-in. by $\frac{1}{2}$-in. bar, $1\frac{9}{16}$ in. long, secured by screws or brazed or silver-soldered to the top plate; the foot, a piece of $\frac{1}{8}$-in. by $\frac{3}{8}$-in. bar, $\frac{5}{8}$ in. long, attached to bottom of column by same methods. The block



Return crank



Eccentric-rod

frames, should be exactly parallel, and the underside of the base at right-angles to both. It would therefore be advisable first to clean up the frame contact face with a file, then clamp it to the faceplate (you can drill the three screwholes and use those for bolts or set-screws) and face off the part where the outer plate is attached, to a distance of $1\frac{13}{16}$ in. from the faceplate. Check the top surface with a try-square, and see if it is square with the two surfaces already machined; if so, bolt it to the faceplate and face off the base to a measurement of $1\frac{13}{16}$ in. from the top. As a variation, I have shown a single screw attachment between base and guide-bar, but you can use four small ones, as shown on the drawing of the inside gear, if you so desire. Mark out the hole for the link trunnion, and drill it with a drill a little undersize, say No. 15.

Next, clean up the outside plate, drill the three screwholes and countersink them, and drill the hole for the link trunnion as above; then fit the plate to the main casting, with the drill put through both the trunnion holes to keep them dead in line. Run the No. 30 drill through the screwholes, making countersinks on the contact face; follow up with No. 40, tap $\frac{1}{8}$-in. or 5-B.A., and fix with countersunk screws. Remove the No. 15 drill, and poke a $\frac{3}{16}$-in. parallel reamer through both holes; the link trunnions should then fit without shake, but be perfectly free.

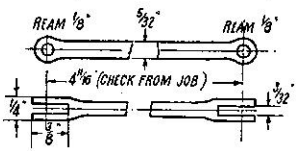
Erection

To erect, file or mill away sufficient of the back flange, to clear the leading coupled wheel, as indicated by the curved line in the illustrations; then set the complete bracket with its base on the end of the guide-bar, and the back flange against the frame. Clamp temporarily in position; locate screwholes in frame and guide-bar as described above, drill and tap, insert screws, and Robert is, once more, your avuncular relation. Either hexagon-head set-screws, or bolts, can be used to hold the bracket to the frame; if the latter, simply drill No. 30 holes clean through frame, using those in the flange as guide, and put your bolts in. This saves tapping the frame.

Brackets can be built up by those who like that method. The top can be cut from $\frac{1}{8}$-in. sheet metal (brass or steel) and the angle for fitting to frame, riveted on. Alternatively, a for attachment of the outside plate could be a piece of $\frac{1}{2}$-in. square rod, $\frac{5}{8}$ in. long, fixed to the side of the column by brazing or silver-soldering, whilst the inner "wing" or plate carrying the inner link bearing could be made from $\frac{1}{16}$-in. sheet metal and attached same way. For sake of appearance, the outer plate should be made from $\frac{1}{4}$-in. steel, and bronze-bushed for the link trunnion. Again, don't forget to make one right- and one left-handed! The erection is the same as given for the cast bracket.

Return Crank and Eccentric-rod

The return crank is filed up from a bit of $\frac{7}{16}$-in. by $\frac{3}{16}$-in. steel rod, or nearest larger size, to shape shown in illustration. As mentioned above, I hate odd thirty-seconds; but as the circle described by the crankpin has to be of a definite dimension, we can't help it in this case, so the distance between hole centres is 29/32 in. Drill both holes either on drilling-machine or lathe, squareness being essential. Slit the bottom of the square with a saw, then plug the hole with a bit of brass rod, and drill a No. 41 hole through edgewise, so that the drill cuts a half-round groove in the plug, which is then removed. Drill the round end No. 32, and make a little crankpin as shown, from $\frac{1}{8}$-in. silver-steel rod, making the

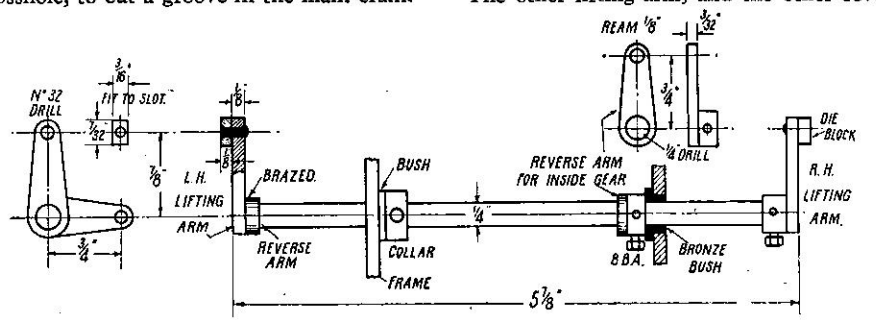


Inside reach-rod

plain part about $\frac{7}{16}$ in. long. Turn down the end about $\frac{1}{8}$ in. length, and screw 6-B.A., and slightly chamfer the plain end. Put on a brass nut to protect the thread, insert the chamfered end into the No. 32 hole and squeeze in until there is a full 5/32 in. of plain projecting on the face of the crank; then cut-off the surplus sticking out at the back, and file flush. Put the crank on the $\frac{3}{16}$-in. projection at the end of the main crankpin, and set "by eye" as near as you can, so that the return crankpin is $\frac{1}{2}$ in. from the axle centre, and in advance of the main crankpin when the engine is going ahead.

Exact Positions

To get the exact position of the return crankpin, and the exact length of the eccentric-rod between centres of pinholes, the parts of the valve-gear already made must be erected; so connect up the radius-rod, expansion-link, combination-lever and union-link exactly as described for the inside gear, and put them in place, taking off the outside plate of the motion bracket to erect the link. Now put the main crank on front dead centre, and the expansion-link in mid-position, so that the die-blocks will run from top to bottom without moving the radius-rod. Jam the link in that position so that it can't shift; I usually stick a little wooden wedge between link and bracket. Now, with a pair of dividers, take the distance from centre of hole in link tail to centre of return crankpin. Turn the wheels to back dead centre, and try again, without altering dividers. If the measurements don't tally, shift the return crankpin half the difference, and try again. When they *do* tally, the return crank is correctly set, and the distance between the divider points is the exact length of the eccentric-rod between centres of holes, so *don't shift them.* Clamp the return crank temporarily to the pin, poke the No. 41 drill through the crosshole, to cut a groove in the main crank



Reverse or weigh-shaft

spigot, fit a 3/32-in. silver-steel bolt with the ends turned down and fitted with 8- or 9-B.A. nuts for neatness, and you're all set—literally!

The Eccentric-rod

The eccentric-rod is made from a piece of $\frac{1}{4}$-in. by $\frac{3}{8}$-in. mild-steel rod about $4\frac{1}{4}$ in. long. Braze or silver-solder a little block of steel on one end, to bring up the thickness to $\frac{1}{4}$ in., then slot as shown, by methods described earlier in this serial, the fork or clevis being offset. The exact length between centres of pinholes is then marked off with the already-set dividers, and the holes drilled No. 32, after which the rod can be filed or milled to the shape as given in the drawing. No oil-box is needed on the larger boss, as the full-sized engines have a circular boss containing a grease-lubricated ball-bearing. Ours is too weeny for that, so we fit a bronze bush instead, a kiddy's practice job as detailed out in the "Petrolea" serial. Open the hole to 7/32 in. and turn the bush to suit. The fork at the other end is reamed $\frac{1}{8}$ in. Slip the bush over the return crankpin, and secure with a commercial nut and washer. Ream the hole in the link tail $\frac{1}{8}$ in., and put a bolt, made from $\frac{1}{8}$-in. silver-steel turned down to 3/32 in. at both ends and nutted, through the lot.

Reverse-shaft

The reverse-shaft is made from a piece of $\frac{1}{4}$-in. round silver-steel, or ground mild-steel, squared off each end in the chuck, to a length of $5\frac{7}{8}$ in. It runs in two bushes with $\frac{1}{16}$-in. flanges $\frac{1}{2}$ in. diameter, turned to a tight press-fit in the $\frac{3}{8}$-in. holes in the frame. There are four arms on it, two horizontal and two vertical. The two horizontal lifting-arms are made from $\frac{1}{8}$-in. by $\frac{3}{8}$-in. steel, and one of the vertical arms from the same material, being filed or milled to the shape shown. All holes in the smaller ends are drilled No. 32, that in the reverse-arm being reamed $\frac{1}{8}$ in. as well. The holes in the larger ends of the reverse-arm and one of the lifting-arms are drilled $\frac{1}{4}$-in. drive-fit (letter "D" drill) squeezed on to one end of the reverse-shaft, set at right-angles, and brazed. Incidentally, all the small brazing and silver-soldering jobs in the motion work can be done with the self-blowing gas blowpipe made from a bit of $\frac{3}{8}$-in. boiler-tube, which I described in these notes some while ago. Quench in clean water (not acid) and clean up.

The other lifting-arm, and the other reverse-arm (which is made from 3/32-in. metal) have bosses. Drill all the holes both ends No. 32 as before. To make the bosses, chuck a piece of $\frac{3}{8}$-in. round rod in the three-jaw, and turn a pip on the end to squeeze tightly into the No. 32 holes. Part off one piece $\frac{1}{4}$ in. long, and squeeze into the lifting-arm at the large end. Turn another pip, part off $\frac{3}{16}$ in. and squeeze into the reverse-arm. Braze or silver-solder both; after cleaning up, chuck the bosses in three-jaw, with the arms resting against the chuck jaws, then centre, drill 15/64 in. or letter "D" drill, and ream $\frac{1}{4}$ in., this process cutting out the pip and leaving clean holes through arms and bosses. Fit 8-B.A. set-screws in the bosses; also make a collar with a set-screw, from $\frac{1}{2}$-in. steel or brass rod, about $\frac{1}{4}$ in. wide; see assembly sketch.

Die-blocks

The die-blocks are similar to the link die-blocks, but need only be 7/32-in. full lengths of $\frac{1}{8}$-in. by $\frac{3}{16}$-in. silver-steel with $\frac{1}{8}$-in. reamed hole in the middle, very slightly countersunk; they are riveted to the ends of the lifting-arms by rivets

(*Continued on page* 633)

* Railway Interlocking Frames

By O. S. NOCK, B.Sc., M.I.Mech.E., M.I.R.S.E.

No. 6. The McKenzie and Holland "Cam and Rocker" type—Part II

BEFORE passing on to a detailed consideration of the interlocking mechanism, two other general points in connection with the frame may be mentioned. That portion of the lever above the floor plate, it will be seen, stands vertical in the normal position; this is a distinguishing characteristic of all McKenzie and Holland frames. So is the flat top to the lever, where all other makes include doming to a greater or less extent. Another detail, shown in Fig. 6 herewith, is the circular shouldered portion on the lever just below the handle, noted on the drawing as $1\frac{5}{16}$ in. diameter; this, again, is peculiar to all McKenzie and Holland frames. The lever stroke, like that of the Saxby rocker, is long, so giving an easy pull, though, on account of the vertical position when normal, the levers, when pulled, extend a considerable distance forward of the floor-plates. This is not always an unmixed blessing, especially where space is limited. The Saxby rocker frame, with its 4 ft. of stroke, suffers in the same way.

* *Continued from page 611, "M.E.," June 20, 1946.*

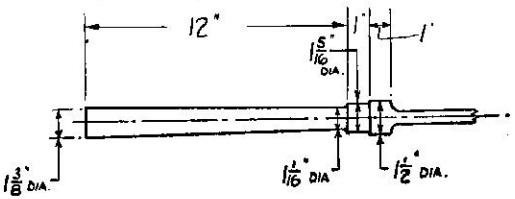


Fig. 6. Lever handle

An enlarged view of the locking mechanism is shown in Fig. 7. It will be seen that the lower end of the cam-tail has two pin joints; the right-hand one of these has connected to it a link from a rocker-piece, or "soldier," as it was called. The complete rotation of the cam corresponding to the movement of the lever from normal to the full reverse position moves the soldier link from right to left, and oscillates the soldier through an angle of approximately 40 deg. The soldier, details of which are given in Fig. 8b, is clamped to a horizontal rocking-shaft running longitudin-

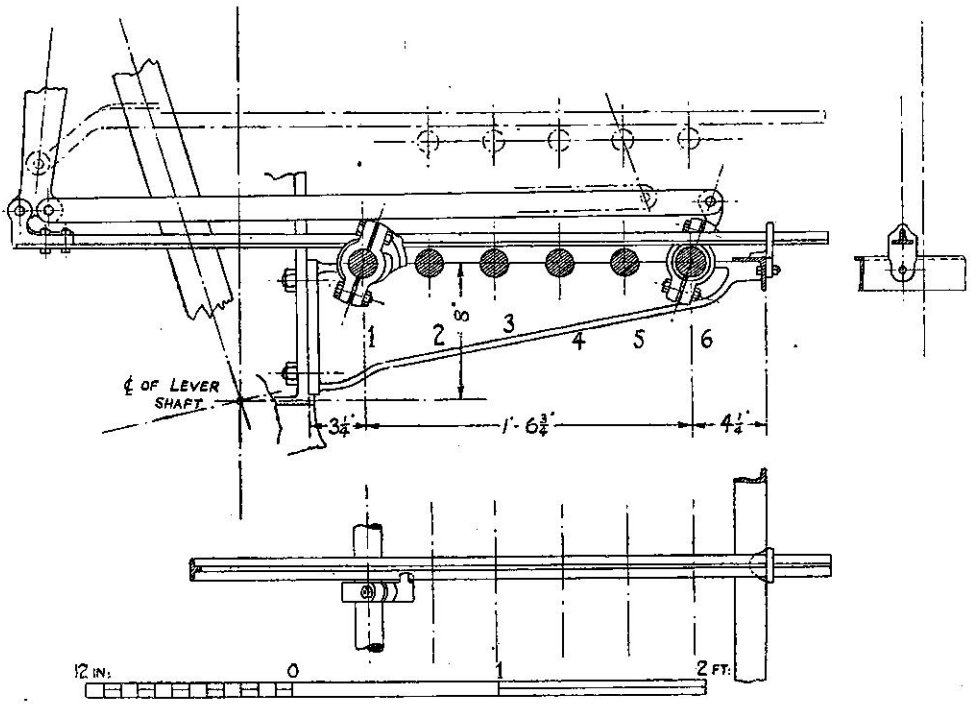
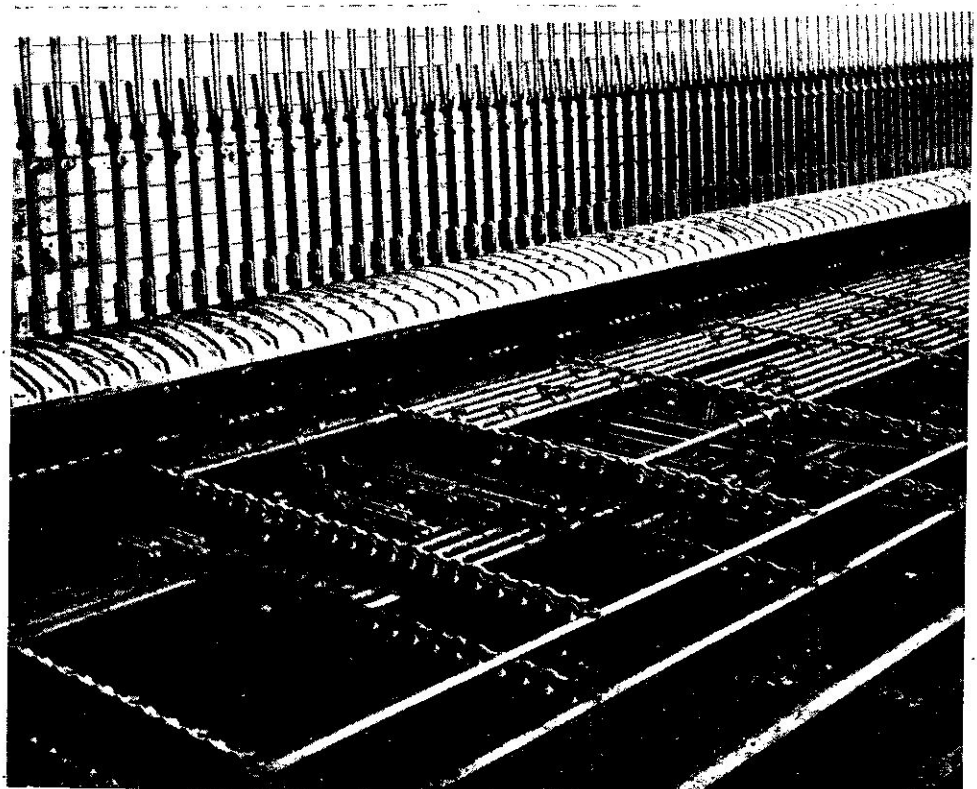


Fig. 7. Locking mechanism.

ally with the frame, and each shaft bracket, as shown in Fig. 7, carries six shafts. On to these shafts are clamped the oscillating locking dogs. Detail of a typical locking dog is shown in Fig. 8a. The action of the locking will be best appreciated by following through the motions in an actual instance. In Fig. 7 the shafts are numbered 1 to 6, No. 1 being the shaft rotated when No. 1 lever is pulled, and so on. We will suppose that the track layout is such that No. 1 lever when pulled releases No. 6, as if No. 6 were a distant signal lever, and No. 1 the "home." To the left-hand pin joint on the cam-tail is attached an L-shaped bracket, having attached to it a long T-iron ; the relative positions of this tee and the oscillating locking dog on No. 1 shaft are shown in the plan view in Fig. 7, and it will be seen that the outstanding tooth-piece on the locking dog overlaps the flange of the tee. A notch is cut in the tee to allow the tooth to pass. Should the signalman attempt to pull No. 6 lever while No. 1 was in the position shown, the engagement of No. 1 lock with the notch in the tee iron would prevent No. 6 being pulled. If, then, No. 1 lever were pulled, and the lock oscillated through 40 deg., as usual, the tooth-piece on the lock would move up clear of the flange of the tee, and so permit lever No. 6 to be pulled. The lock shown in Fig. 8(a) is typical of many varieties used for carrying out various conditions of locking, the shape of the tooth-piece being made to suit the particular requirement.

To accommodate the shafts required in very large frames, arrangements are made to have two tiers of locking on each side of the frame, the positions of the additional shaft-brackets being shown in chain-dotted lines in Fig. 7. Not all the shafts need to be run the entire length of the frame, and in this connection the photograph below is of interest. This shows a portion of the large frame installed at Norwich (Thorpe), Great Eastern Railway, many years ago. There are not only two tiers of locking brackets ; the brackets themselves carry no less than twenty-three locking shafts, and the overhang is such that the brackets have to be specially supported at their outer ends. Although the Great Eastern, and other of the pre-grouping lines, installed a number of these frames, by far the most extensive application was on the North Eastern, which railway, as will be recalled from my previous series of articles on semaphore signals, was almost exclusively a McKenzie and Holland preserve. Many frames of this type are still in use ; a fine example, at Leeds, Canal Box, was dismantled as recently as 1937, when the new colour-light signalling was brought into use.

(To be continued)



Portion of McKenzie "cam and rocker" type frame built for Norwich (Thorpe) Station, Great Eastern Railway

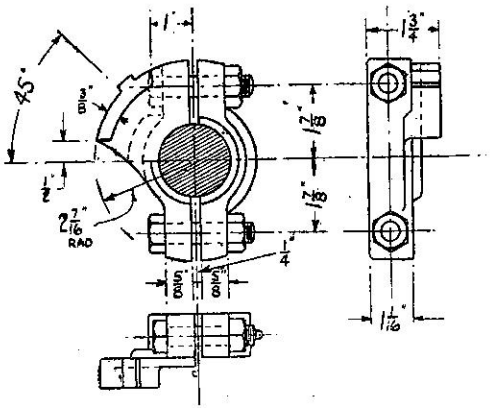


Fig. 8a. Locking dog

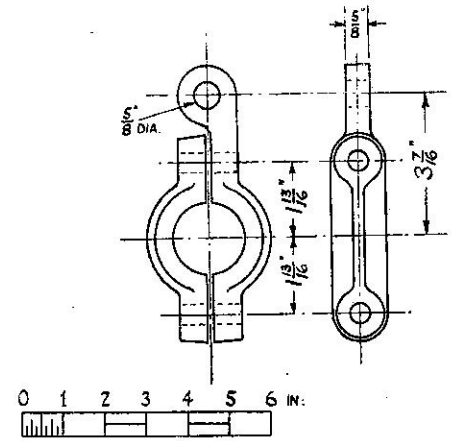


Fig. 8b. Rocker for actuating locking shaft—usually termed "Soldier"

"Hielan' Lassie"

(*Continued from page* 630)

made from ⅛-in. silver-steel. They should be able to turn freely on the rivets, which will be a tight squeeze-fit in the No. 32 holes in the arms.

To erect, poke the shaft through the bush in the left-hand frame, put on the collar, then the bossed reverse-arm, boss toward right frame; then push the shaft through the other bush, and put on the bossed lifting-arm. Enter the die-blocks in the slots in the radius-rods, then adjust until both lifting-arms are parallel, so that both expansion-link die-blocks are exactly in the middle at same time, and the lifting-arms just touching the radius-rods; then tighten set-screw in right-hand boss. Set the collar against the bush in left-hand frame, and tighten screw; set the inside reverse-arm against the bush in right-hand frame, see it is vertical, and tighten that set-screw. To make certain the bossed arms cannot move on the shaft, drill No. 53 holes clean through bosses and shaft, and squeeze in pins of ⅛-in. silver-steel.

The Final Connecting-rod

All we now need is a connecting-rod between the inner reverse-arm, and the one on the leading reverse-shaft, so that both move simultaneously when the wheel-and-screw in the cab is operated. This is simply a glorified edition of the union-link, made in exactly the same way from a piece of ¼-in. square steel about 5 in. long. Ream the pinholes in both forks ⅛ in. The nominal length between pinhole centres is 4 11/16 in., but it had best be checked from the actual job as follows. Put both sets of motion in mid-gear, with the die-blocks in the middle of the links, so that when the wheels are turned by hand, the radius-rods do not move. Then take the distance between centres of pinholes on the reverse-arm of the inside gear, and the inner reverse-arm on the shaft of the outside gear, using a big pair of dividers; and the distance between the points is the length required. The reverse connecting-rod is attached to the arms by a bolt in each fork, made from ⅛-in. silver-steel reduced and nutted at each end.

Setting the Valves

To set the outside valves, just take off the steam-chest covers, and put the motion in mid-gear, so that when the wheels are turned by hand the radius-rods do not move. Adjust valve nuts until the black line of each port shows under the lap of the valve, when the crank is on the corresponding dead centre; that is all there is to it, as the results of the pins, tin and cardboard antics will see to the rest!

COUPLINGS

By

Old Gaumless

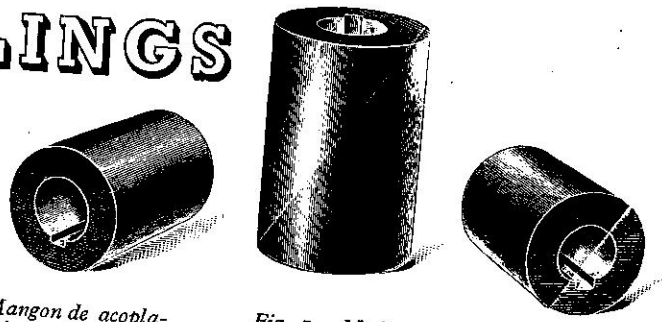


Fig. 1. Muff or solid sleeve coupling

MANCHON à Plateaux; *Mangon de acoplamiento con brida corriente*; *Scheiben Kupplung*; or, in plain English, couplings. If we were to ask the ordinary man in the street if he knew what constituted a pair of shaft couplings, he would probably be able to give a reasonable description of some pattern he had seen, but, to ask him how many different types there are would certainly be beyond his ken. For that matter, I wonder how many of our own circle of MODEL ENGINEER readers could name, say, 10, without having to ransack their memories.

In this article, I intend to describe and illustrate quite a number but, as space is very limited these days, I must, of necessity, divide the subject into sections. To do this successfully, I propose to group the couplings into the following classes: (1) *Rigid*; (2) *Flexible*; (3) *Universal*; (4) *Special*, and deal with them in that order. I only hope that these efforts of mine will succeed in interesting you, by reviving the memories of those who

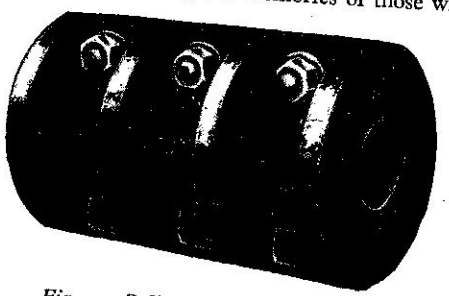


Fig. 2. Split sleeve or box coupling

have seen them before, by planting the seeds of ideas for adaptation in our models and workshops, and by correcting quite a few erroneous impressions. Although all my descriptive matter is according to full-scale practice, there is no reason why the items described should not be scaled down to suit our own requirements, so long as the main principles and natural laws are obeyed. I shall not introduce any intricate technical matter or theoretical formulae, as we are not compiling a textbook. Further, stressing out the proportions of small models does not always work out in quite the same way as full-scale practice and I want to avoid complications.

Rigid Couplings

The word "rigid," when applied to couplings, means exactly what it says. When we use a pair of such couplings for the purpose of joining together two separate shafts, the joint is unyielding, or "rigid." In other words, when the couplings are fixed in position the shafts become, to all intents and purposes, one solid, single, shaft.

One of the oldest types of rigid coupling is as Fig. 1, known as the "muff" (from its similarity to the Victorian lady's hand-warmer), or "solid sleeve"; it is (according to most millwrights), a blooming nuisance! Sometimes keyed on with a single taper key going right through, and sometimes by two gibhead keys driven in from the opposite ends, I have occasionally found the keys to be headless and incapable of withdrawal. In this latter case, and when the keys and bores have suffered corrosion, etc., owing to age, the couplings have often to be burst off when removal or uncoupling is necessary.

A decided improvement upon this type is the "split sleeve" or "box" coupling (Fig. 2). This is much easier to remove and, by fitting sheet-steel covers can be made to look like the "muff," whilst they also act as a safety device and prevent the accumulation of dirt and dust, etc.

Another type of solid sleeve coupling I frequently came across at one time was the keyless type, shrunk on to the shaft ends. Fig. 3 shows the method adopted, and so far as easy removal was concerned, this was just about the limit! It is, however, very useful for very small shafts and looks much neater than the solid sleeve secured by set-screws, and, as the shaft ends overlap, a positive drive is ensured.

Yet another split-sleeve coupling, although much longer, and I believe, patented, is the one carried on board ship for the purpose of joining together the broken ends of a propeller-shaft. A relative of mine, one "Orlando," once suffered such a catastrophe whilst out on the "blue" in vile weather. His ship had lost way, was broached to, wallowing about in mountainous seas, and this

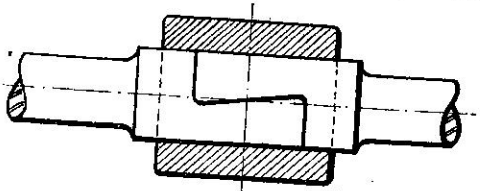


Fig. 3. Keyless coupling

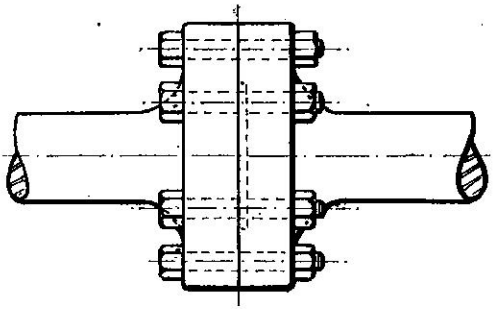


Fig. 4. Marine type coupling

coupling could not be found. With the "old man" continually sending frantic messages down below for steerage way, Orlando procured a spare pair of propeller-shaft brass bearings, clamped them around the fracture and pegged them fast to the shaft ends. He managed to reach port in this manner, with the engines at slow and the brasses twisted and distorted to an alarming degree. "Necessity is the mother . . . !"

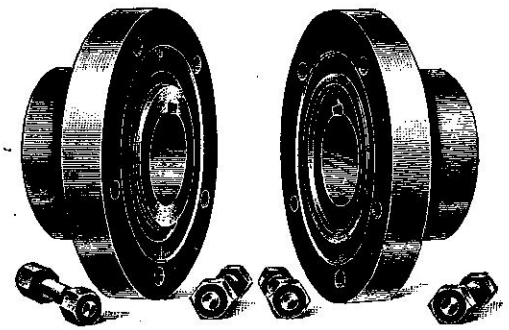


Fig. 5. Ordinary flanged coupling

For marine work or, when the heaviest duties are to be contended with, the couplings are usually of the flanged type, forged solid with the shaft ends (Fig. 4).

Modern Methods

This brings us to the most popular of modern couplings, the flanged variety, of which there are many types. Of cast-iron construction consisting of two halves, machined all over, they are occasionally made in steel when it is necessary to deal with severe loading and where a solid forging cannot be utilised. Fig. 5 shows a dismantled coupling of the "ordinary" pattern with the bolt-heads and nuts protruding, and, although it still enjoys a certain amount of popularity, it is being superseded by the "safety" couplings. The reason for its decline is not far to seek, as the Factories Act of 1937 says, ". . . Every set-screw, bolt or key, on any revolving shaft, wheel or pinion, shall be so sunk, encased, or otherwise effectively guarded as to prevent danger. . . ." Fig. 6 is an illustration of the "recessed"-type, a typical "safety" coupling with the bolt-heads and nuts "recessed" in the flanges, thus overcoming the obvious danger to persons who have to work in their proximity. Another "safety" coupling and just about the most popular of the flanged types is the "pulley" or "safety flange" (Fig. 7). The bolt-heads and nuts are shrouded by the "pulley"-type flanges, hence its name.

All these flanged couplings, including the marine-type, are provided with bright steel fitted bolts, the number and size being in relation to the shaft diameter and duties to be performed. A fairly common practice is to use a bolt diameter equal to one-quarter of the shaft diameter, i.e. 2-in. shaft, $\frac{1}{2}$-in. bolts; 2$\frac{1}{2}$-in. shaft, $\frac{5}{8}$-in. bolts; 3-in. shaft, $\frac{3}{4}$-in. bolts; and so on. This does not apply in the larger sizes, say, above 6 in. diameter shaft, as the flange has then increased its face area so that a number of relatively smaller bolts can be used. The smaller couplings, up to 1 in., could have three bolts; between 1-in. to 4-in., four bolts; between 4-in. to 6-in, six or eight bolts, whilst the solid forged marine-type coupling, more often than not, has just as many bolts as can be conveniently spaced out on the flange face. The bolts should, of course, be spaced out equidistantly upon their pitch circle, and when the two halves are bolted up, the keyways, for the sake of neatness, should be in line with each other.

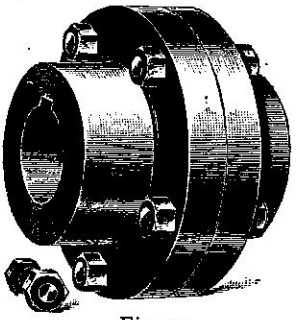


Fig. 5a

In this connection, it is necessary to take care when drilling the bolt-holes, so that the keyways in both halves conform to this practice.

In practically all of the flanged-type couplings, as you will see from the foregoing illustration (Fig. 5), one half is provided with a "spigot" and the other with a "faucet" (in engineering parlance, male and female halves), the spigot being

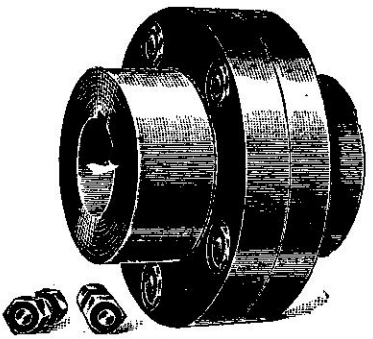


Fig. 6. Recessed coupling

a push-fit in the faucet, its length being relatively unimportant. This arrangement, when the two halves are bolted up, centralises the shaft ends, prevents any shearing action upon the bolts should any bending moment occur at the coupling joint, and facilitates erection.

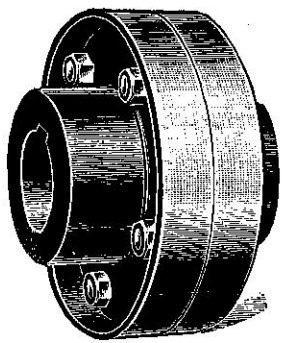


Fig. 7. Pulley or safety flange coupling

For drives where there is no shock load, a compression coupling similar to Fig. 8 is commonly used and, having the pulley-type of flange, it is a " safety " coupling. No keyways or keybeds are necessary and the coupling is easily and quickly fitted or dismantled. I did hear, some years ago, that the Americans had actually twisted a 6-in. shaft completely in two with a pair of these couplings without their showing any signs of slip. Be that as it may, I have had great success with them upon shafts up to 4 in. diameter, but would not care to fit them to anything greater, and, of course; if there is any suggestion of shock or impulsive loading, the keyed or forged flanged type is much the better job. You will note that fitted bolts are not used with this coupling, as they are not called upon to carry any appreciable torsional load, the power being transmitted by the compressed taper sleeve.

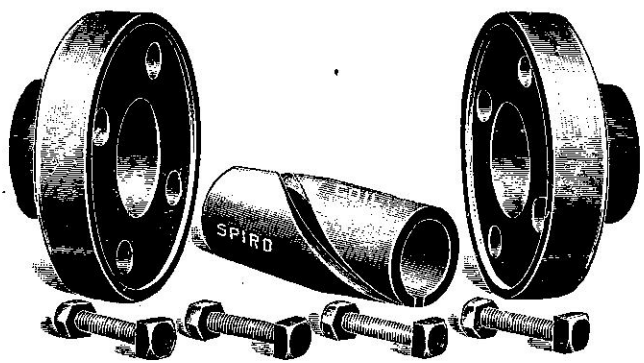


Fig. 8. Compression coupling

I do not propose to describe any more "rigid" couplings, although there are quite a few, but, as the main principles are the same, there does not appear to be any reason for dwelling upon them.

Fitting

Finally, therefore, let us consider a most important matter connected with flanged couplings, and that is the fitting. Wherever possible use lathe-turned shafting ; it is much better than cold-rolled or bright drawn, as I will explain in an appropriate article. Further, the centres are usually left in the shaft ends and this is a great help, as you will see later on. Make certain that the coupling bores and shaft ends are correct for a driving fit. (In the larger works, couplings are either shrunk or pressed on hydraulically.) *Well* tallow or grease both the bore and the shaft end. Use an easy-fitting key or portion of a key to act as a guide and, to prevent the coupling twisting out of position whilst driving home. Fit the key so that it is " *on* " at top, bottom, and *sides*. After finally driving the key home, pop the whole caboodle back into the lathe centres and skim up the coupling face dead true, turning off the ragged end of the key, etc., at the same time. This truing up of the coupling faces is of vital importance and many transmission failures are due to its omission, more particularly in the larger sizes. It is surprising how far the coupling face can get out of truth by the fitting on the shaft, plus key-lift, no matter how fine the machining limits have been.

These remarks do not concern the " compression " coupling, and for this one, the following remarks will be of assistance. See that both shaft ends are truly straight, smooth, and free from burrs. Make sure that neither of the shafts enter beyond the centre of the sleeve. Draw the outer shells together over the sleeve and see that the alternate bolts are gradually tightened one after the other. Tapping the outer ends of the hubs with a hammer, and retightening the bolts will ensure extra gripping power. To true the coupling, chalk the pulley face of the coupling at the part which runs high and tighten the bolts nearest the chalk mark, and see that the space between the two flanges is circumferentially uniform. To remove the couplings, remove the nuts and bolts, insert a cold chisel between the rims, thus forcing the shells apart. Rap the shells lightly when they will slide down the sleeves. One point in favour of this coupling is its ability to accommodate shafts which are not quite dead size.

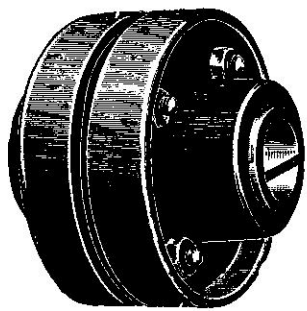


Fig. 8a

The illustrations are reproduced by courtesy of Messrs. Crofts (Engineers) Ltd., Bradford.

(*To be continued*)

Model Wire Rope Making

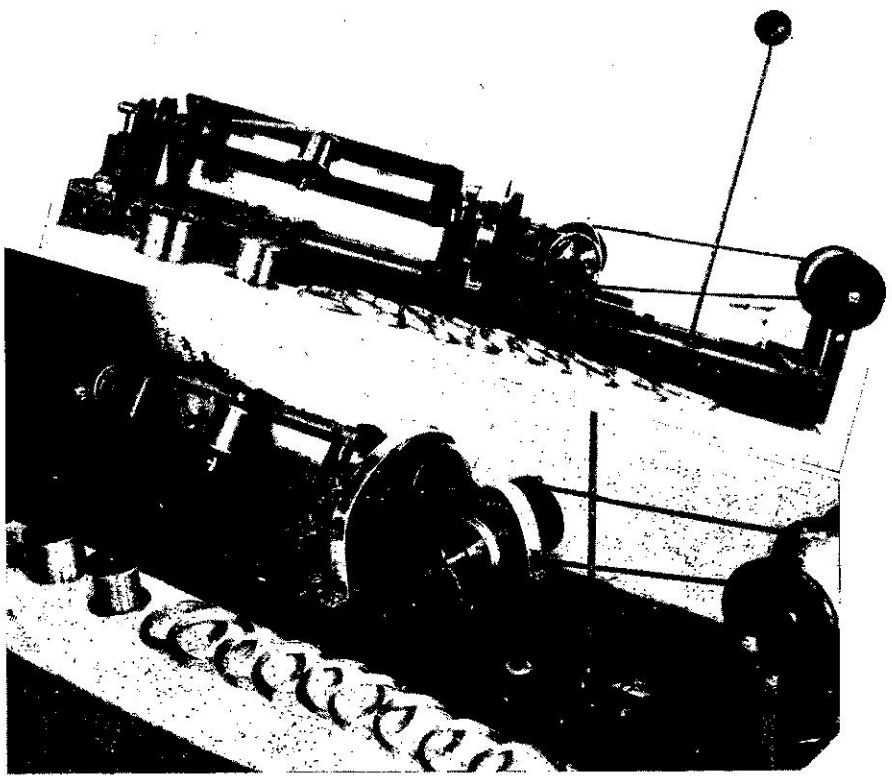
(Photographs by H. V. Garside)

IN many kinds of models, the need is felt for wire ropes of a size and type in keeping with the size or character of the model. Some constructors have attempted, with varying success, to make their own wire ropes, but it is now possible to obtain them ready made, thanks to the enterprise and ingenuity of a professional craftsman in this industry, who is also a keen model engineer. Mr. J. Partridge, of Sheffield, who was incapacitated by illness some years ago, decided to put the results of his lifelong experience to good use in producing scale model wire ropes for the benefit of model engineers.

The first requirement in this enterprise was a machine for twisting the continuous strands of wire, and this was constructed by Mr. Partridge, entirely from odds and ends of material, and using hand tools only, no lathe being available. It works on a simple principle, the individual strands of wire, up to any required number, being first spooled simultaneously on a bobbin, which is then mounted in the rotating frame of the machine by means of a cross spindle. A light frictional braking load is applied to the bobbin to provide tension, and the strands are pulled through the hollow spindle of the frame by means of a geared take-off pulley, being at the same time twisted together by the rotation of the frame, and finally pass over a guide pulley on to a belt-driven take-up bobbin.

The frame may be operated by hand, treadle or power drive, and will produce ropes in continuous lengths, up to a limit determined only by the capacity of the feed bobbin. This machine was demonstrated in action at the recent exhibition of the Sheffield Model Engineering Society, where it aroused considerable interest. Samples of the ropes produced have been submitted for our inspection, and appear to be in every way suitable for their intended purpose.

Mr. Partridge informs us that he has now produced a new machine for winding compound or multi-strand ropes, having up to 36 wires in 4 strands. His address is 39, Swan Street, Attercliffe, Sheffield.

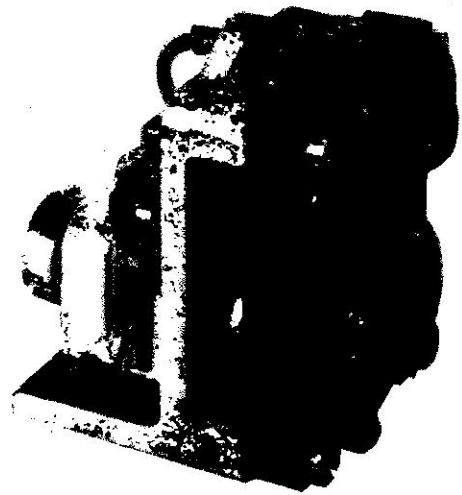


Above : Mr. Partridge's wire rope making machine
Below : A close-up of the winding frame, showing samples of the wire ropes produced

A 7¼ oz. MAGNETO

by

A. JARRARD



THE following machine was made with the average amateur mechanic's ordinary tools, and consists of a cast aluminium angle bracket, carrying the stator and winding, condenser, contact-breaker, and bearing for shaft, upon which is mounted the rotating magnet assembly, consisting of a non-magnetic alloy flange diecast on to the shaft, and having attached to its face, two pole shoes and the Ticonal magnet assembly, by means of four rivets and a brass cover plate. The making of the machine is best begun by filing up the faces of the four pillars on the casting until they are facing flat, and then proceed to file the base true, and square with these faces.

Next, take the pack of laminations, which may be obtained from any of the makers of transformer laminations, cut to outside size, and mark out carefully the four No. 4-B.A. holes for fixing screws, also the three rivet holes, Fig. 1. The corners of the cross members should be rounded off to 3/64 in. radius, and two sides cut out of 1/64-in. bakelite, fibre or stiff card, the centre pole carefully cut to fit over a layer of thin linen varnished on to cross member, and a small hole in each side coming out on the same side of core; see that sides are perfectly dry, and varnish in place with good shellac varnish. Commence primary winding from right-hand side with holes toward you, wind on closely three layers of No. 28 s.w.g. enamelled wire, wrapping each layer with thin paper coated with varnish. Just before the finish of primary, scrape about ⅛ in. of enamel, and solder about 1 in. long strand of finest wire (5 amp. copper fuse-wire is suitable), draw end of primary through hole in side on left, leaving fine strand through covering of primary; to this end must be soldered beginning of secondary consisting of forty layers of No. 46 s.w.g. enamelled wire. Wind each layer slightly shorter than the one preceding it, commencing as far out as possible and finishing up about ¼ in. in from each side, covering each layer with tissue paper varnished with well thinned-out shellac varnish. Finish winding by soldering on three strands of 5-amp. fuse-wire twisted together, and projecting horizontally from top of winding on the same side as primary wires, and bind with linen or silk tape well varnished and gently baked for as long as possible, taking care not to scorch insulation. If the plug lead is required to pass close to any metal-work, it must be insulated with varnished silk; otherwise, a bushing of ebonite or rubber tubing in the hole at top of main casting will be sufficient.

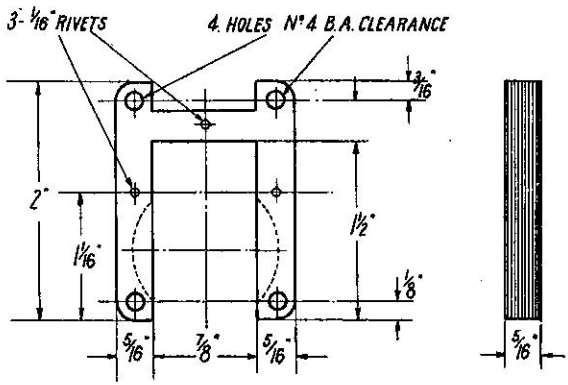


Fig. 1. Transformer steel, 17 plates 0.018-in. thick

The boring of complete assembly is the next job, and this is best done by clamping the base of aluminium casting to an angle-plate bolted on to faceplate of lathe, and set to ⅜ in. below centre. The tunnel is bored to fit the paper-covered magnet assembly snugly; this will allow the necessary clearance, and a hole is also bored at the same time, to

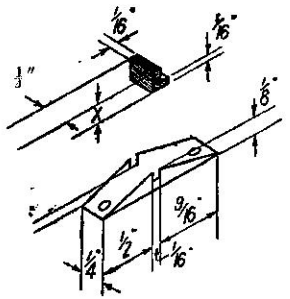


Fig. 2. Contact-breaker lever.

long, assembled so that each alternate foil projects at either end, and inner end lies about $\frac{1}{16}$ in. from end of mica plate; the projecting ends of foil being doubled back over the edges of two thin plates of bakelite or similar insulating material.

The condenser is best assembled between a few small nails driven into a piece of flat wood, and each layer stuck with well thinned-out shellac varnish, after assembly, and before bending back foils, press assembly tight with a piece of wood held down by two wood-screws and bake gently for as long as possible to exclude moisture, after which, the clips, which are cut out of thin brass and bent to shape, may be pushed over ends of foil tightly, in order to ensure good electrical contact.

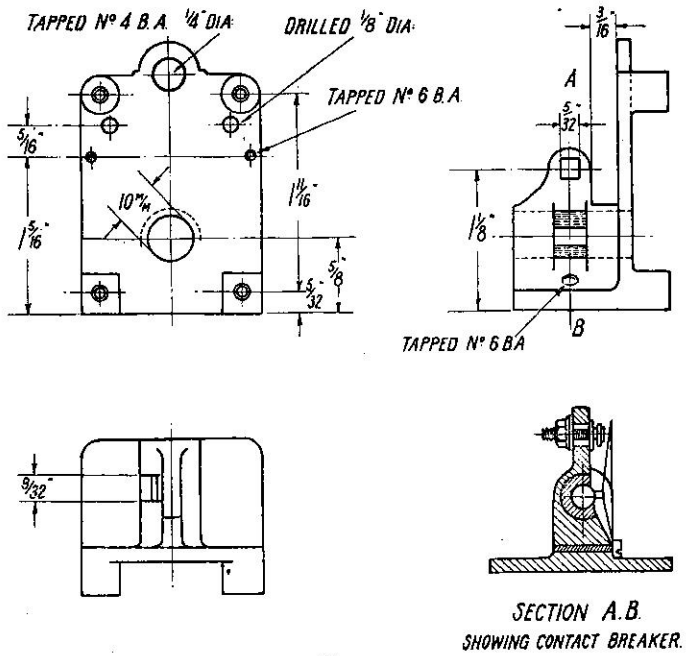


Fig. 3

take the self-oiling bush, which should be a light press-fit. This completes the machining of the assembly.

The contact-breaker lever is made from a piece of sheet-steel cut from a household dried-milk tin, this being of a suitable thickness, and is bent up square, as shown in Fig. 2, and afterwards cut to shape on the edges, also $\frac{1}{16}$-in. wide slot. A small piece of reinforced bakelite or horn fibre is cut to shape and fitted between sides of lever, the edges of which are now closed down on to fibre to hold it firmly in position. The lower portion of fibre L-piece should lie in the same direction as it is desired the magneto should run.

A hole to clear a No. 6-B.A. screw should now be drilled in the shorter end of lever to correspond with the fixing hole in main casting, as shown in Fig. 3, section *A*, *B*.

The condenser consists of 60 mica plates cut to size, Fig. 4, and 60 foils $\frac{1}{2}$ in. wide × $1\frac{1}{8}$ in.

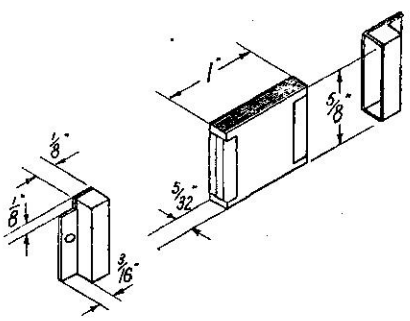


Fig. 4. Condenser and clips

Left-hand clip of condenser must be insulated from face of casting with thick paper.

After pressing in bearing bush, the slot for contact-breaker to work in can now be cut to just wider than outside of lever, and to shape as

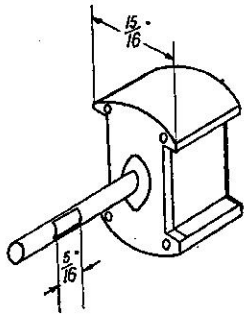


Fig. 5. Rotating magnet assembly

shown in Fig. 3, section *A*, *B*, and a hole drilled $\frac{1}{16}$ in. diameter in casting to receive adjusting contact-screw. This hole is then filed square to receive ebonite bush, which may then be tapped No. 6-B.A.

The contacts, which may be of either platinum or tungsten, are fixed, one to the top end of lever, and the other to the filed-down head of a No. 6-B.A. screw about $\frac{1}{2}$ in. long, by first heavily tinning faces of lever, screw and contacts, and pressing together with hot soldering iron until solder runs, after which, all surplus solder may be scraped away and contacts polished with very fine emery-cloth.

The rotary magnet assembly, which can be obtained ready-made, will be found to differ from the drawing, Fig. 5. It will be necessary to file sides of pole-pieces to an equal distance from shaft centre and sides parallel. Inside edges may be thinned for lightness to the level of the magnet, and close up to the rivets. The screwed end of shaft may be cut off, if not required for driving; this will leave about $\frac{3}{16}$ in. of shaft projecting, to which may be clamped a split driving-dog, to allow timing the spark to the best advantage.

The small flat on the shaft should now be filed, so that contacts open when the edges of magnet pole separate from corresponding edges of tunnel about $\frac{1}{16}$ in.

[The writer informs us that he is prepared to assist readers who wish to construct this magneto by supplying complete magnet assemblies, castings and other items, details of which will be announced in THE MODEL ENGINEER advertisement columns in due course.—ED., "M.E."]

News from the Trade

MODEL ENGINEERS' SUPPLIES

Builders of small locomotives should get into touch with "Locomotive Construction Units," c/o Quickset Toolholder Co. Ltd., Floriston Gardens, Stanmore, Middlesex, who are preparing to produce a range of machined frames, cylinders, wheels and other parts for various types of miniature locomotives, 1¼-in. to 3½-in. gauges. The quality of material and workmanship in these parts is, we know, of a high standard, which should satisfy the most exacting requirements. All castings are produced from master-patterns, and are absolutely clean in every way; the machining is done with the aid of expensive jigs and fixtures and to the highest degree of precision. In short, these products are the work of a firm which thoroughly understands the requirements of its customers, and spares no effort to ensure satisfaction.

The same firm will also have available soon castings for some new designs of attachments for milling and gear-cutting, which, we think, should be of interest to many readers.

We have received a copy of a small catalogue of castings, tools and materials from Gordon Green, 19, Crowland Avenue, Hayes, Middlesex. The price of the catalogue is 6d. The list covers a range of castings for 2½-in. and 3½-in. gauge locomotives; boiler fittings; solid-drawn copper tube from 3/32 in. to 6 in. diameter; steel flats; iron and copper rivets; brass rods and angles; screws, nuts etc., and a set of castings for the "G" bench drilling-machine. We note that the prices, where quoted, are reasonable and competitive, and also that any casting can be supplied separately from a set. Supplies may be very short in quantity, but they are certainly extensive in variety, and we think readers will find Mr. Green's selection a useful one.

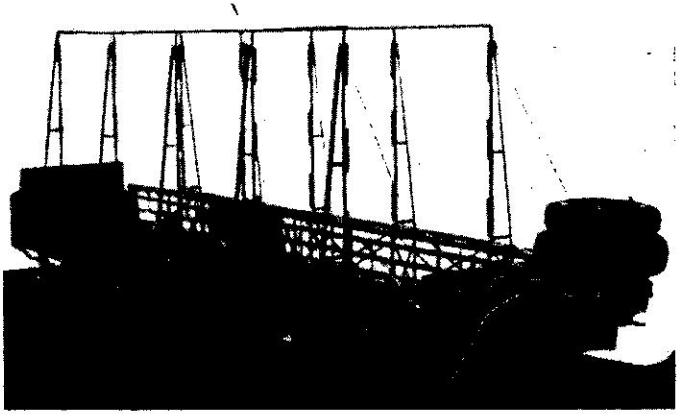
CASTINGS FOR SINGLE-ACTING STEAM ENGINE

Messrs. W. J. Hughes, of 87, Hopedale Road, Frecheville, Sheffield, have submitted for our inspection a set of castings for a single-acting piston-valve launch engine, ⅞-in. bore by ⅜-in. stroke. The set consists of fourteen castings in gunmetal and two in aluminium-alloy, and two sheets of blueprints are included, which furnish all required details of machining, assembly and valve timing; also five sheets of instructions.

All castings are of good-quality material, which machines well, and is hard enough to assure good wear; nearly all are clean and well-defined in detail. A minor criticism of the sample set submitted is that the cast lettering on the base-plate—which, by the way, may not be considered the best possible place to put it—has a letter missing, a fault which is no doubt due to an accident to the pattern, but which calls for attention. The design of the engine follows fairly well-established lines, and it should produce an efficient engine for any high-performance type of model power-boat, though some modifications in the material employed may be desirable for an engine intended for a racing hydroplane. The cylinder is equipped with auxiliary "uniflow" exhaust ports, and is steam-jacketed. A somewhat unusual feature is the use of a connecting-rod of cruciform cross-section.

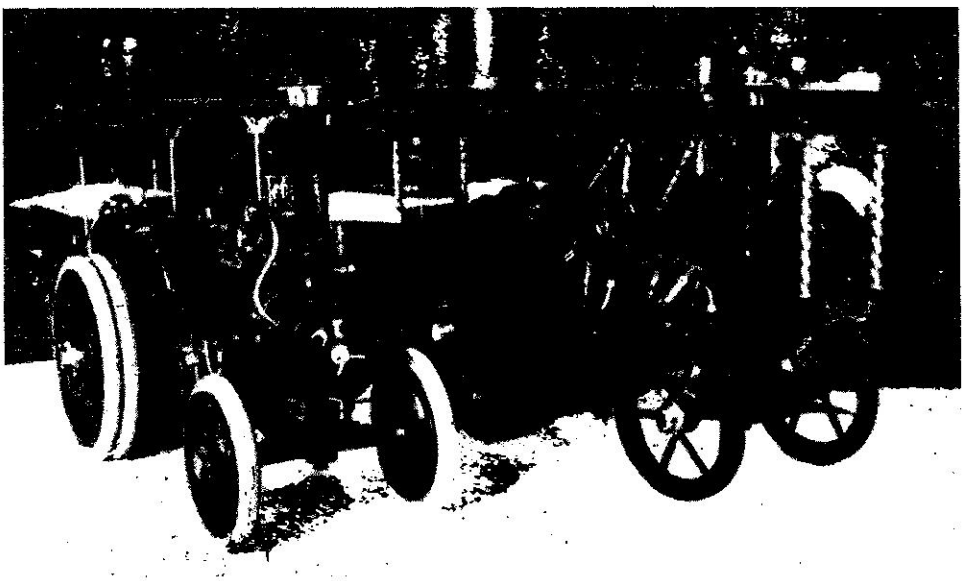
The draughtsmanship shown in the drawings is very workmanlike and clear and, at the price quoted, the set represents good value for money.

Models at Andover



A model of an R.A.F. trailer as built by Messrs. Tasker's, of Andover

A VERY successful exhibition of models was held recently by the Andover and District Model Engineering Society. The exhibits ranged from a complete electrically-operated "OO"-gauge layout to a 7½-in. steam operated passenger-carrying railway, steam tractors, stationary boilers, ships, ancient and modern, aircraft of many designs and nationalities, and various handicraft exhibits, was the finest collection of mechanical craft and skill ever shown in Andover. Exhibits from other societies included Messrs. Atkinson and L. Willoughby's "Schools" and "Lord Nelson" 3½-in. respectively. Two "singles" by Sir Walter Alcock, of Salisbury, and a prize-winning model sailing yacht from Southampton, were subjects of great interest, and the idea of coupling four models together, working from an air-compressor proved a great attraction. These were an upright pumping engine, a horizontal internal-combustion engine, a showman's traction engine, and another tractor, proving that these models were as capable as their prototypes. One ingenious "O" gauge clockwork layout was constructed entirely from scrap material. An innovation was a draw for a doll's-house constructed and furnished by Mr. W. A. Croshall, and also the refreshment stall, where the lady members worked hard during the last day. The exhibition opened on Saturday, April 20th, at 3.0 p.m. to a packed house, and extending to 9.0 p.m. Easter Monday night, was a complete success, and the spontaneous efforts by all members, young and old, reaped a just reward. Over 2,000 people paid for admission to the exhibition, and Mr. Lillington's efforts with his 7½-in. gauge "Urie," delighted hundreds of children and adults, including His Worship the Mayor and the Mayoress, and was a working advertisement to the exhibition above.



Two of the showman's traction engines at the Andover exhibition

Letters

Model Electric Traction

DEAR SIR,—I was greatly interested to note the various replies appearing in THE MODEL ENGINEER about the above subject and am very pleased to realise that my appeal is beginning to awaken some interest.

With "L.B.S.C's" remarks I am most cordially in agreement, and I have often thought what fine locomotives would be forthcoming if only the electric traction enthusiasts had their own "L.B.S.C." to cater for their branch of model work and give the necessary "words and music" for building electric models.

When it is remembered that, to my knowledge, the only large model electric locomotive for which designs have been published was described in THE MODEL ENGINEER in 1905, to Mr. Greenly's designs with motors provided by Mr. A. W. Marshall, it speaks volumes for the lack of interest in electric traction in model form that no design on more modern lines has been produced in over forty years.

I am afraid that the lack of interest in electric traction is also due to some extent to the attitude of the railway companies. When a railway company evolves a new steam locomotive, the publicity men hail the newcomer with great delight, technical descriptions are given in meticulous detail and the whole railway fraternity goes wild with enthusiasm; but when an electric locomotive is put on the road it is almost a matter of hush-hush! Little is done in the way of publicity and technical descriptions are, in the main, conspicuous by their absence. In this connection, it is interesting to note that the Southern Railway "Merchant Navy" locomotives have been clearly described in technical journals with line drawings of various features, but where has there been published a technical survey of the same company's magnificent electric locomotives CC1 and CC2? These locomotives have a most interesting control system which enables them to maintain tractive-effort while passing over gaps in the conductor-rails, but neither a description of the apparatus employed, illustrations of individual items of such equipment, nor wiring diagrams, have to my knowledge ever been published.

Again, a great deal of the mechanism of a steam locomotive is available for all to see so that the study of the features of the engine is comparatively easy, but in the case of electric engines and multiple-unit motor-cars the mechanism is out of sight between the frames or enclosed in boxes mounted on the underframes, or enclosed in compartments labelled "Private," "No unauthorised person must open these doors," or "No unauthorised person is allowed to remain in this driver's cab." Consequently, interested persons have little opportunity or inducement to study the various features of interest to them unless indeed they are prepared to risk the wrath of the powers that be and do a bit of unauthorised "nosing round." In this connection, "London Transport" is something of an exception to the above criticism, since this authority has staged several shows in which electric traction has been well featured.

Finally, may I make a further appeal to all model engineers who have built or are building passenger-hauling model electric locomotives not to "hide their light under a bushel," but to write to the Editor and send along the details of any work they have done or have in hand? I am sure that he will be pleased to have such contributions. May I also suggest that those who have an inclination to take up electrical research as a hobby should attempt the production of traction motors and control gear for say ½ in., ¾ in. and 1 in. scale electric engines and, most important of all, publish their results in THE MODEL ENGINEER?

Apologising for the length of this letter.

Yours faithfully,

Bognor. F. L. GILL-KNIGHT.

Right and Left-handed Filing

DEAR SIR,—Your editorial headed "Left-handed Mechanics," reminds me of a remarkable discovery, at least it struck me so, which I made when "doing my bit" as an assistant manager of a Government Training Centre way back in '41.

At that time "every avenue was being explored" to turn out the most efficient trainees. I made it my personal business to study those who lagged behind in training. In the fitting shops, whilst there were exceptions, every left-handed trainee seemed to find difficulty in using a file—the stance they took looked awkward and one seldom heard that gratifying grrr . . . which accompanies a file doing its job.

Could it be possible that the ubiquitous file is "handed?" This proved to be the case—a file *is* right-handed. The bias on the teeth is such that, except when the traverse is made in a "true course," more often there is a sliding from left to right, it cuts more effectively for a right-handed operator than one who is left-handed.

With a right-handed operator the lateral movement is left to right and the reaction is taken by leaning in a forward direction, as he is on the left side of the file.

In the case of a left-handed operator, standing on the right of the file, in order to use the bias he has to pull the file towards him and in consequence has less control on his balance—or as was usually found to be the case, pushes from *right to left* and looses the effectiveness of the file.

There are a few files made without this bias, but if you examine most files by rubbing a finger against the teeth at an angle to the length, a distinct difference in resistance will be felt if the motion is tested with the inclination to the left or the right.

Now here is a poser—and I give it after practical experience in training men and women by the thousand for the war effort—excepting the exceptions which one must always except—women never make good filers, but they beat men hollow with a scraper. No—it has nothing to do with the potato peeler or opening cans of pork and beans—it goes away back into that dim distance when women started being different from men, and vice versa.

Yours faithfully,

Topsham. T. SHEARMAN GIBBONS.

Clubs

The Society of Model and Experimental Engineers

The last meeting before the summer recess will be held at 39, Victoria Street, Westminster, S.W.1, on Saturday, July 13th, at 2.30 p.m. The talk on this occasion will be given by Mr. Edgar T. Westbury, who will discuss various types of rotary valves applied to internal combustion engines.

Full particulars of the Society may be obtained from the Secretary, J. J. PACEY, 69, Chandos Avenue, Whetstone, N.20.

The Tyneside Society of Model and Experimental Engineers

Meetings for July will be as follow:—Wednesday, July 3rd, 7.30 p.m., at the Workshop, feature programme by Marine Section; Saturday, July 20th, visit to Hawthorne Leslie's Shipyard, Hebburn-on-Tyne. Further details and times later. Wednesday, July 31st, 7.30 p.m., at the Workshop, demonstration by J. K. Thomas, M.A., construction of "OO" gauge locomotives. Schedules for Model Section, Throckley Show, are now available at the Workshop.

Hon. Secretary: S. G. JONES, 56, Moor Crescent, Gosforth, Newcastle-upon-Tyne.

The Bristol Society of Model and Experimental Engineers

On June 6th we had a very interesting talk on "Plastics," given by Mr. R. H. Forshaw.

This was well attended and, judging by the questions asked by members, it was obvious of the interest shown.

Hon. Secretary: C. C. LUCY, 28, Bibury Crescent, Henleaze, Bristol.

Preston Society of Model Engineers

This society is now firmly established. Meetings are held on the first Monday of each month at 10, Leyland Road, Penwortham. All interested should communicate with the Hon. Secretary, MR. A. HARDMAN, 4, Nook Crescent, Grimsargh, Preston, Lancs.

Brighton and District Society of Model and Experimental Engineers

On Sunday, May 26th, an inaugural meeting was held by members of the above society to open the track which they have built and laid at Shoreham-by-Sea. About 30 members and friends were present, and there was a "Brighton Atlantic" 3½-in. gauge, also a "Dyak" 2½-in. gauge, which both had some very successful runs. The lines are also laid for 6-in. gauge, but our locomotive for this is not yet in running condition.

On Friday, May 31st, we had a very successful Jumble Sale, and many tools, materials, and models changed hands, to the great satisfaction of sellers and purchasers and amusement of the onlookers; a meeting of over 40 members.

It is hoped to pay outside visits to interesting places during the summer recess, particulars of which can be obtained from the Secretary, Mr. E. L. MEAD, 73, Langdale Gardens, Hove, at a later date. Stamped addressed envelope, please.

Oxford and District Society of Model and Experimental Engineers

Membership is now 75, which is remarkable in view of the fact that we were only formed in April this year.

Work on the society's own 5-in. gauge locomotive—a G.W.R. "Hall" class—is making good progress and the finish on the parts so far completed indicates that it will be a real "exhibition" affair. Our programme for the near future is as follows:—Friday, June 28th, Rummage Sale; Friday, July 26th—"Bits and Pieces." Every Friday night—Workshop, 7-9.30, except for the above evenings.

General Secretary: H. A. GOODINGS, 4, Manor Grove, Kennington, Berks.

Tees-side Society of Model and Experimental Engineers

This society is now well established, and a programme is now in being. Meetings are held fortnightly on Tuesday evenings, at 7 p.m., in the Temperance Institute, Woodlands Road, Middlesbrough.

A party of members has been invited to visit the workshop of the Constantine Technical College, at 7 p.m. on Wednesday, July 3rd.

Hon. Secretary: J. W. WHITTON, 21, Chester Street, Middlesbrough.

Portsmouth Model Engineering Society

At the last meeting held on June 5th, at the Central Library, fifty-four members were present, and the question of affiliation to the M.P.B.A. was discussed.

The Chairman, Mr. T. A. Bedford, thanked Commander Brown, R.N.V.R., for his efforts in making it possible for fifty members to visit and inspect the Radar equipment at H.M.S. *Collingwood*, Fareham, just recently, a visit that was greatly appreciated by all members concerned.

Members were informed about a lecture arranged for July 3rd, on the teleprinter with practical demonstration; and on July 7th, Radar control of model aircraft, both these meetings at the Central Library, where all meetings will be held in future. The meeting concluded with a brief description by Mr. Jubber on his prize-winning 3½-in. gauge "Southern" free-lance locomotive.

Mr. Jubber's description of the unorthodox methods he adopted for boring and turning of wheels and cylinders on his home-made lathe caused many laughs.

Mr. C. A. V. Colebrook gave a description of his patented expanding brake.

Full particulars of the society's activities can be obtained from the Hon. Secretary, Mr. H. A. HANDSFORD, 5, Milton Road, Copnor, Portsmouth, Hants.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects, which should be addressed to him at 23, Great Queen Street, London, W.C.2. Matter intended for publication should be clearly written, and should invariably bear the senders' name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall and Co. Ltd., 23, Great Queen Street, London, W.C.2.

Correspondence relating to display advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 23, Great Queen Street, London, W.C.2.

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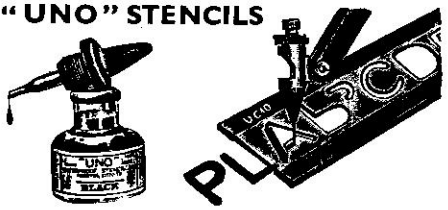

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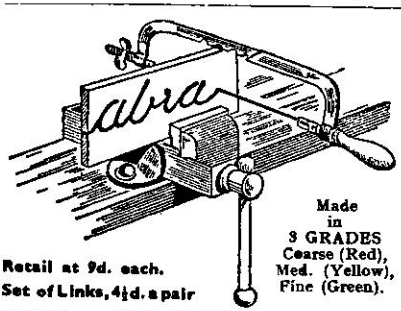

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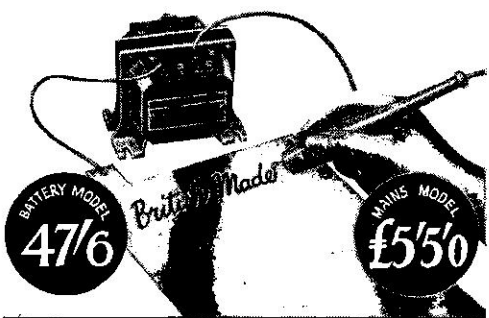

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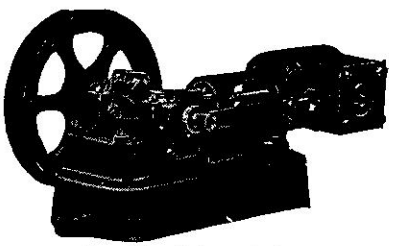

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